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Tool for Predicting the Effect of Delay in Payment on the Performance of Building & Road Construction Projects in Ethiopia

BY

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APPROVAL PAGE

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LIST OF ABBREVIATIONS

MoWUD: Ministry of Works and Urban Development

CCAE: Consultancy service for construction Contractors association of Ethiopia.

PPA: Public Procurement Agency

U.K: United Kingdom

CIDB: Construction Industry Development Board

CCA: Construction Contracts Act.

RCGT: Raymond Chabot Grant Thornton.

HGCRA: Housing, Grants, Construction and Regeneration Act

FIDIC: Federation International des Ingenieurs-Conseils: a French acronym

(Interpreted in English as International Federation of Consulting Engineers

ABSTRACT

Delayed payments of works done on construction projects in the Ethiopian construction industry are considered to be a factor of significant concern. It causes severe cash-flow problems to Contractors and this can have a devastating effect on the performance of the Contractors and the progress of the projects. This study assessed the causes and impacts of delayed payments in road and building construction projects in Ethiopia. The objective of this study was to formulate a predictive tool that can predict the effects of delayed payments on the performance particularly, on the cost and time performance of building and road projects. Delayed payments' factors were collected from literature review and data were collected through questionnaire survey and from Archival documents. A total of 38 filled questionnaires from clients, consultants and contractors were collected. The collected data were analyzed with SPSS version 20 software and the most significant factors were identified. Based on these significant factors, Multiple Regression Analysis (MRA) was made with SPSS software and a regression equation is obtained for predicting cost and time overrun percentages. From the analyses, it was found that the cost overrun percentage is 1.80% and the time overrun percentage is 33.30% of time overrun. The most significant delayed payment factors impacted on cost and time overruns were identified and ranked using respondents' response rate and by the Relative Importance Weight (RIW) analysis. The most significant factors impacted on cost and time overruns were: Clients' failure to finance the project,Clients' poor financial management,Clients' delay in certification and Contractors submit claims without adequate supporting documents. The study concluded based on the findings of the research and recommendations for further studies were forwarded to alleviate delayed payment problems.

Keywords: delayed payment, construction industry, regression model, SPSS soft ware, predictive tool

CHAPTER ONE

1.1. INTRODUCTION

Delayed payment issues nowadays have gone to the point that it tends to decrease the good image of construction industry in Ethiopia and these are considered as a factor of significant concern to all the players in the industry.

In Ethiopia, the construction industry is the highest recipient of government budget in terms of government development program. Consequently, public construction projects consume an average annual rate of nearly 60% according to MoWUD (2006) of the government's capital budget.

According to Odeyinka, H.A. and Yusif, A, (1998), late payment problem is endemic in construction and needs to be explicitly recognized as the problem recurs from project after project. Payments, which imply a major problem as it is needed to pay for materials, labour, plant, subcontractors' account rendered, preliminaries and general overheads expended during the progress of the work". When the flow of money into a business is delayed, the net cash flow will become negative. When this happens, the Contractor would require immediate funding to overcome the cash deficit. Therefore, late payment affects time, cost and quality as good quality construction requires prompt payment, so that progress would not be affected.

Late payment will affect cash flow of a company and may eventually lead to company's insolvency. Timeliness of payment is important to avoid the risk of late payment problem. Once a payment problem starts to expand, it typically gets worse over time and will shift the financial burdens from one participant to other participant and create cash flow problem. In Ethiopian construction industry, it is normal practice for some Clients to shift some risks to other parties further down the chain by reducing their financing costs through delaying of payments. This will shift the financial burden to the contractors who may not have large capital assets and large amounts of credit available to cover payment delays.

Contractors are also causes of late payments. Most of the time, Contractors would blame Clients when they receive late payment; however, Contractors also contribute to this situation. In

hiswork, Reeves (2003) stated that "one of the main reasons for delayed payment is when there are errors in submitting claims. This includes claims without adequate supporting documents, wrongly calculated claims and those submitted without using the correct procedures". When this is the case, Contractors need to resubmit the claims after making the necessary corrections. Another factor contributing to delayed payment is when Contractors fail to agree with the valuation of work on site. This would then result in conflicts between Clients and Contractors which could lead to dispute resolution and hence, delayed payment will be occurred.Literature reviews indicate that contracts can also be the causes of late payments. There are cases where contract agreements do not bring any justice to both main Contractors and subcontractors (Artidi and Chotibongs, 2005). One good example is when for instance, the 'pay-when-paid' clause is often used in contract agreements between main Contractors and subcontractors (Adballa and Hussein, 2002).

In Ethiopian construction industry, completion of a project within specified cost and time is a major challenge. One of the basic problems facing building and road construction Contractors in the current economic conditions is payment default.The practice of well-organized and timely payments in construction projects is one of the main issues leading to a good project's success.The importance of payment is further amplified by the fact that the construction industry relatively involves long durations to complete projects,large amounts of money to spend and the wide use of credit payment term rather than payment on delivery in purchasing of materials (Ameer, 2005b).In light of the above, it becomes necessary to formulate a tool that can predict the effects of delay in payment on the performance, that is, on the cost overrun and the completion time of building and road projects.

1.2. STATEMENT OF THE PROBLEM

Delayed payments for work done affect many players in the Ethiopian construction industry, whether in government or privately funded projects. It causes severe cash-flow problems especially to Contractors and has a devastating effect down the contractual payment chain.

Delay in payment means there is a delay in progress compared to the baseline schedule. While, problems of delay in payment has continued to worsen in the construction industry (Pitcher, 2010)

The significant causes of delayed payments identified in this study were delayed payments caused by Contractors, delayed payments caused by Clients, delayed payments caused by contractual matters and other factors like delay in valuation and certification of interim payment by consultants, involvement of too many parties in the process of honouringcertificates,heavy workloads of Consultants to carry out evaluation for work done and Contractor's misinterpretation of Client's requirement of variation order,

According to Davenport (2010) the Construction Industry Development Board's Construction Industry Indicators (CII) had conducted a survey in Cape Town in 2009. The survey indicates that only 42.00% of Contractors were paid on time and 58.00% of payments to Contractors were made 30days or more after invoicing. Payments delays in 2009 show quite a significant deterioration compared with the payment delays in 2007 and 2008. CIDB's CEO, Ronnie Khoza states that the issue of payment delays is a very serious matter. The delays could be the result of a poor quality of invoices or corruption within government departments.

Contractor Calculator reveals from a latest Contractor survey that a whopping 88.00% of Contractors have been receiving their payment late from their agency or Client. According to Dave Chaplin, CEO of Contractor Calculator, this is a sad reflection of the times, particularly as 37.00% of respondents suffering delayed payment have a contract with the public sector.Consultancy service for Construction Contractors Association of Ethiopia (CCAE) has conducted baseline survey on the local construction sector of Ethiopia including constraints related to the payment procedure and their influence on performance and growth of Contractors. Accordingly, the following constraints are identified in relation to the payment procedures: -

- The existing 30-days of provision to effect payment by the Client are too long.
- Indefinite delay of the consultant to process and approve payments for executed work & materials supplied to site.
- Delay of the Client to effect approved payments beyond 30 days
- Resistance of the Consultant to approve equivalent value of the executed work and resistance to pay for materials supplied to site.

In this paper,Multiple Regression Analysis (MRA) wasconducted and a regression model is developed for predicting cost and time overrun percentage for road and building construction projects.

1.3. OBJECTIVES OF THE RESEARCH

1.3.1. GENERAL OBJECTIVE

The general objective of this research was to formulate a predictive tool or model that can predict the effects of delayed payments on the performance particularly on the cost and time performance of building and road projects.

1.3.2. SPECIFIC OBJECTIVES

- To identifying the causes and the responsible parties to the causes of delay payments.
- To analyze the effect of the delay of payment on the cost and time overrun of the projects.
- To identifythe most significant causes or factors for establishing a tool that can predict the effects of delayed payments on the performance of building and road projects.
- To formulate a tool or model that can predict the effects of delay in payments on the performance of building and road projects, that is, on the cost and time overruns.

1.4. RESEARCH QUESTIONS

The study posed the following research questions to achieve the objectives.

- What are the causes of delayed payments?
- What are the impacts of delayed payments on costoverrun and time of completion?
- What are the remedies to be taken?
- What is the relationship of delay in payment with cost overrun and time of completion?

1.5. SIGNIFICANCE OF THE STUDY

The study has identified the causes and effects of delayed payments of building and road construction projects in Ethiopia. Therefore, the findings of this study will enhance the awareness of the three main parties (Employer, Contractor and Consultant) and other professionals in the construction industry about construction payment problems that are common in building and road construction projects in Ethiopia. The result of this research has formulated a tool or model that can predict the effects of delayed payments on the performance, specifically, on the cost and

time overruns of building and road projects which may be of significance to Policy makers, Developers, Consultants and Contractors. It will also help in reducing delay in payment by controlling the significant factors for delayed payment issues and help project planners, cost estimators and project managers for budgeting and progress reporting.

CHAPTER TWO

2.0. LITERATURE REVIEW

2.1. GENERAL

The construction industry has a great impact on the economy of all countries [Leibing, 2001]. It is one of the sectors that provide crucial ingredients for the development of an economy. According to Chitrakar (2004), the construction industry in many countries accounts for 6.00-9.00 % of the Gross Domestic Product (GDP); and according to Bhimaraya (2001), it reaches up to 10.00 % of the GDP of most countries. In Ethiopia, its percentage of GDP amounts to 6.00%, [MoWUD, 2006]. The construction industry is a vital element of the economy and has a significant effect on the efficiency and productivity of other industry sectors. One cannot think of wide spread investment in manufacturing, agriculture, or service sectors unless the construction results of infrastructure facilities are in place. In some of the developing countries, the growth rate of construction activity outstrips that of population and of GDP [Chitrakar, 2004].

2.2. CONSTRUCTION INDUSTRY IN ETHIOPIA

Ethiopia has a rich history of magnificent construction endeavors. The ruined palace of Queen Sheba at Yeha, the Obelisks of Axum, the rock-hewn churches of Lalibela, and the castles of Gondar are few examples of these expertises. With the arrival of modern civilization, especially during the late 19th and early 20th century, there have been some significant developments in this regard. Even though, the development of the construction industry in Ethiopia is slow, it plays a key role in the development of the national economy. The role, the construction industry plays in socio-economic development is significant. It provides the basis upon which other sectors can grow by constructing the physical facilities required for the production and distribution of goods

and services. The construction industry has a significant multiplier effect on the economy as a whole [MoWUD, 2006]. According to MoWUD (2006), the inter relationship between the construction industry and the broader economy largely emanates from three of the industry's characteristics namely:

- The public sector is its major Client;
- It's large size, ability to produce investment or capital goods which contribute significantly to national GDP; and
- It is a major source of Employment, directly and indirectly by its multiplier effect.

Public construction projects in Ethiopia are parts of the country's development initiative. It shared considerable amount of the country's scarce financial resources. In Ethiopia, the construction industry is the highest recipient of government budget in terms of government development programs. Consequently, public construction projects consume an average annual rate of nearly 60.00%, according to MoWUD (2006), and 58.20% according to Wubishet (2004), of the government's capital budget.

2.3. NEED FOR MONEY IN PROJECT PROCUREMENT

Construction is capital intensive. The importance of money in construction can be likened to that of blood inhuman being. Money is the lifeline of any construction work and dictates the scope, pace, quality, direction and final product. Money is needed to acquire construction resources such as materials, labour, plants and management expertise. The Contractor also requires working capital to finance day-to-day activitieson a construction site. Working capital is a critical element needed in achieving successful construction procurement. According to Austine and Neale, (1986), money is the most important resource of all. Without it, the Contractor cannot acquire the other resources and will not be able to maintain his liquidity.

Many Contractors under estimate the need for this resource and these accounts for the high number of bankruptcies in the construction industry today. In developing countrieslike Ethiopia, the small and medium sized indigenous Contractors fall victim of this error, especially, when delayed or non-payment occurs. Indeed, Contractors in different industries differ in their requirement of working capital. In accordance withAustine and Neale (1986), the issue is not about profit, but about the working capital necessary to run a contract.

The construction industry presents a peculiar problem because the nature of the industry makes it possible for Contractors to operate with low working capital anddepend solely on progress payments for their cash flow requirements, such that any disruption on payment creates severe consequences. In recent time, economic recession, inflation, political instability, unstable exchange rate, high cost of borrowing, and high construction cost, has created unfavorable business climate, which has eroded business confidence in the construction sector. Consequently, even the very few large Contractors are not willing to source or use their money to finance a constructionproject. The risk involved is very high and many who took the risk in the past never recover. This is evidenced by the high rate of bankruptcies and project abandonment in the construction industry**.**

2.4. THE CASH FLOW ON A CONSTRUCTION PROJECT

Cooke and Jepson (1979) defined cash flow as the movement of money in and out of a business. Money flowing into the business is termed positive cash flow (+ve) and is credited as cash received, while money paid out is termed negative (-ve), and is debited on the business. The difference between the positive and negative cash flow is termed the Net cash flow. According to Ward (1979), the cash flow on construction project can be established by viewing the movement of money in a construction cycle. Conversely, the Contractor would not have to wait till the end of the construction period before receiving payment for the month he carried out work; therefore, he receives interim payment at various periods during the construction between the commencement and completion based on the agreement between the Contractor and the Employer. Normally, interim payments are made on monthly intervals.

2.5. WHAT IS PAYMENT IN THE CONSTRUCTION INDUSTRY?

Payment is a sum of money paid to someone in return for goods, work done or services rendered. In the construction industry, payment is the sum of money paid to Contractors after their work for certain projects has been successfully completed. In a typical engineering and construction contract, it is clear that the Contractor has promised to carry out all the works under the contracts. On the other hand, the Employer must keep his side of the promise by giving necessary consideration to payment when due which in most cases comes in monetary form. Payment is

considered as the life blood of the construction industry because, construction projects often involves very large capital outlay (Ameer, 2005).

It is very obvious that a healthy and consistent disbursement of money is a critical point in determining Contractor performance. In order to ensure the flow of the work activities under the contract and its eventual successful realization, construction contracts have to be drafted. Most of these standard forms of contracts contain specially drafted clauses which govern all aspects of the subject of payment under the contract. According to Johnston (1999), survey of the Payment Performance in Britain has shown that the construction industry, in particular, was prone to late-payment culture, with payment of debts due to sub-Contractors and suppliers being made, on average, 53 days after invoices or applications for payment had been rendered. As stated by Kennedy (2005), 'Payment, not unexpectedly, has always been the main subject of disputes.' It is anticipated that conflict if unsettled, will escalate in to disputes which can also cause late and non-payment.

Several relevant studies have been conducted in the United Kingdom which addressed the problems related to payment issues in the construction Industry. For example, the Latham Report (Latham, 1994) has introduced some radical measures to resolve problems related to payment issues in the construction industry by introducing the Construction Contracts Act, establishing mandatory trust funds for payments and suggesting that adjudication should be the normal method of dispute resolution. Some of the recommendations have been incorporated in the Part II of the Housing Grants, Construction and Regeneration Act 1996.

2.6. PAYMENT IN A CONSTRUCTION CONTRACT

Payment in a construction contract is an agreed sum of money paid by the Employer to the Contractor. The provisions relating to payment concern the way the Contractor is paid by the Employer. The consideration given by the Employer to the Contractor is not always a fixed amount of money. However, there are only certain circumstances inwhich the contract sum can be changed and the most important of these is where there are variations. The Contractor undertakes to carry out and complete the works in return for the Employer's promise to pay him a named sum of money.

This money under the MoWUD conditions of contract clause 58 is named as "provisional sum". This sum, adjustable in defined circumstances, is to be paid to the contractor at times and in a manner specified in the conditions. The Employer usually makes an advance payment so that the Contractor will not face financial problem in mobilization of equipment and materials for the project.

2.7. TYPES OF PAYMENT IN CONSTRUCTION CONTRACTS

2.7.1. ADVANCE PAYMENT

The Employer must pay any amount entered against in the contract particulars as advance payment on the stated date. It is reimbursed to the Employer by deducting cumulatively the installments specified in the contract particulars in the calculation of the amount to be stated in interim certificates as payable to the Contractor. Clause 51(1) of PPA (2006) states that the employer shall make advance payment to the Contractor of the amount stated in the special conditions of contract by the date stated in the special conditions of contract, against provision by the Contractor of an unconditional bank guarantee in a form and by a bank acceptable to the Employer, denominated in Ethiopian birr in the amount of the advance payment. The guarantee shall remain effective until the advance payment has been repaid, but the amount of the guarantee shall be progressively reduced by the amounts repaid by the Contractor and interest will not be charged on the advance payment.

2.7.2. INTERIM PAYMENT

In any construction project cash flow is very essential and most construction contracts recognize this fact; by allowing for the making of payment on account to the Contractor before the works are completed.

According to Clifford and Richard (2004), contractors are normally paid monthly; however, it is necessary to read the contract to understand the details. They also added that, one of the most important aspects of any owner's reputation with contractors is the time required to process the payment after submission of the monthly pay estimate by the Contractor.

Slow payment or delayed payment leads to higher bids and fast payment leads to lower bids. The actual process of submitting the monthly pay estimate involves estimating the percentage of

completion of each job activity, calculating the amount due for each of those activities, and subtracting the retention money from the total. The Engineer issues interim certificates stating the amounts to be paid to the Contractor, following the Contractor's request for payment throughout the construction period. The amount of money in an interim certificate is an installment of the contract sum reflecting the accomplishment of the Contractor's obligations since the previous interim certificate. The amount in an interim certificate is to be determined based on the work the Contractor has executed since the previous interim certificate.

Most standard conditions of contract contain specific provisions for interim payments and require payment of interest to the Contractor if the Employer fails to pay on time. The timing of these interim payments as the work proceeds is of importance to both Employer and Contractor.

Under the MoWUD and PPA conditions, regular payments based on the quantity of work done during the previous month, must be made by the employer to the contractor at monthly intervals. The amount of work done is measured by the Engineer under the contract, and valued in accordance with the terms of the contract. The Engineer then issues a certificate of payment showing the amount which the Employer must pay to the Contractor.

Clause 60(2) of the MoWUD conditions of contract also justifies that "the contractor will be paid monthly, within 30 days of the presentation of the Engineer's interim payment certificate to the Employer, 100% of the estimated value of the work executed up to the end of the previous month, together with the value of materials on site intended to form part of the permanent work as and from such time as they are reasonably, properly and not prematurely brought upon the site but only if adequately stored and/or protected against weather or damage. Payment shall be subject to retention in the sum of 10% of value certified until completion of the works. The amount shall be reduced to 5% at completion, which sum shall be retained until the expiration of the maintenance period."

2.7.3. FINAL PAYMENT

Progress payments are payments made only on account of the final amount to be requested and contracts usually provide a time within which the Contractor must make a final request. Clause 60(6) of the MoWUD condition of contract states that, not later than 30 days after the date of issue of the maintenance certificate the Contractor shall submit to the Engineer a statement of

final account with supporting documents showing in detail the value of the work done in accordance with the contract together with all further sums which the Contractor considers to be due to him under the contract. Within 30 days after receipt of this final account and of all information reasonably required for its verification, or after the issue of the maintenance certificate, whichever is the later, the Engineer shall issue a final certificate.

2.8. CERTIFICATION OF PAYMENTS

The regular flow of cash is very critical to a Contractor's survival. As a result, interim certificates are issued at intervals as the work proceeds, and their issue entitles the Contractor to be paid a certain proportion of the contract price. Under a construction contract, there is usually a prescribed time for the Engineer to issue a progress certificate and the issue of such a certificate by the Engineer imposes upon the Employer a strict obligation to make payment.

John and Will (2000) justify that interim certificates exist simply as a mechanism for confirming that an installment of the consideration is due to the Contractor. Whichever method is used to calculate the amount of money due, an interim certificate is not conclusive about anything. It says nothing about quality of materials or workmanship, nor does it indicate satisfaction with the work done to date. Anything included in such a certificate may yet be the subject of a later certificate. It is only the final certificate that is ever conclusive which signifies the contract administrator's satisfaction with the work, or the amount that is finally due to the Contractor, or both of these things. As a result, the only obligation arising from an interim certificate is an obligation on the Employer to make a payment within the stated time. Failure to do so is a serious breach of contract.

Under the MoWUD condition of contract clause 60(1) it is stated that the amount to be included in an interim certificate should cover;

(a) The quantities and value of the permanent work executed on Site.

(b) The value of materials on site intended to form part of the permanent work togetherwith supporting invoices.

(c) The value of temporary work, as included in the bill of quantities and completed on Site.

(d) An amount reflecting any changes in cost pursuant to clause 70 hereunder.

(e) Amounts approved in respect of day works executed up to the end of the month inquestion.

(f) The monthly statements shall be in an approved form and shall comprise an original and one copy, each duty signed by the contractor.

The purpose of including the value of materials stored on site in interim certificates is because the procurement of construction materials and equipment in advance is a good practice that saves money and promotes the timely completion of construction projects. Therefore, by allowing progress payments to include payment for materials and equipment stored at the construction site, the Employer can easily take the full benefit of advance procurement of materials and equipments which are directly necessary for the specific project.

The standard conditions of contract for construction of civil work projects (MoWUD, 1994) places the responsibility for carrying out interim valuations and calculation of what is due and finally issuance of the interim certificates upon the Engineer. Clause 2 of the said condition of contract provides the Engineer to issue this certificate in response tothe Contractor's request for payment. If the Engineer believes that the work has progressed to the point indicated and the quality of the work is in accordance with the contract documents, such a certificate can be issued for each periodic payment request. Certification is the most important aspect of these decision-making powers related to the issue of certificates.

These have been defined by Wallace (1995), as the expression in a definite form of the exercise of the judgment, opinion or skill of the Engineer, architect or surveyor in relation to some matter provided for by the terms of the contract. However, this does not mean that every expression of opinion or decision given by the contract administrator will amount to a certificate. It will only be a certificate if it is so described in the contract, or can be so treated by implication.

2.9. TIME SCALE OF INTERIM PAYMENTS

In the construction industry, it is common practice for payment of the contract sum to be made by installments. One of the main purposes of this is to reduce the need for the Contractor to fund the development of the project. This is because the total value of each contract forms a large proportion of a Contractor's annual turnover.

Clause 60(2) of the MoWUD condition of contract sets out the method and the timescale in which the Employer is to pay the contractor for work done. It says "the Contractor will be paid

monthly, within 30 days of the presentation of the Engineer's interim payment certificate to the Employer…" but, this condition of contract says nothing about what happens if a situation arises where the Contractor has not been paid during the construction of the works. Whereas, the PPA standard bid document sub clause 43.1 states that if the Employer makes a late payment, the Contractor shall be paid interest on the late payment in the next payment. Interest shall be calculated from the date by which the payment should have been made up to the date when the late payment is made at the prevailing rate of interest for commercial borrowing for each of the currencies in which payments are made.

2.10. PAYMENT PROCEDURES

The Contractor is paid progressively as the work proceeds. These progress payments are based on a progress claim (request for payment) prepared by the Contractor for the work he has executed. The claim outlines the breakdown of the work and the quantity of work completed against each item of work. The progress claim also usually show approved contract variations. Whenever the Engineer receives a payment request document from the Contractor, he will ensure the compliance of the works executed with that of the contractual drawings, specification and the quantity of the work executed. In some instances, the amount claimed may be more or less than the value of works completed. The Engineer will adjust progress payments accordingly and after verifying the amount claimed, he will then issue a progress certificate based on an assessment of the value of completed work and sends it to the Employer, so that, payments can be made to the Contractor. The progress certificate states that a certain value of work has been completed and therefore the Employer should pay for it. If the Employer is a government, it may need more than one person to authorize the payment, and the account then has to be passed to the paying department of the authority.

Both the MoWUD and the PPA conditions of contract require payment by the Employer within 30 days after the Engineer's payment certificate. But the later obliges the Employer to pay interest on late payments. Under sub clause 43.1 of this condition of contract, it is stated that, if the Employer makes a late payment, the Contractor shall be paid interest on the late payment in the next payment.FIDIC 1987 clause 60 also stated that Interest on late payments due to failure of the Employer to make payment within the time specified.

2.11. WHAT IS DELAY IN PAYMENTS?

Harris and McCaffer (2003), defined delayed payment as failure of a paymaster to pay within the period of honoring of certificates as provided in the contract. Payment delays and losses have been widely recognized as a misery of the construction industry (Kumaraswamy et al, 2011).

The parties involved in the process of payment claim such as Client, Contractor, Consultant, Superintending officer, Architect, Quantity surveyor, Banker and other construction players may cause a payment to be delayed. A delayed payment by a party who is involved in the process of payment claim may have an influence on the supply chain of payment in whole. Problems in payment at the higher end of the hierarchy will lead to a serious knock-on cash flow problem down the chain of contracts.

Payment has been an issue of major concern in the construction industry and majority of Contractors reported that they have went through late payment situation in government funded projects whilst more of them affirmed the same situation in private funded projects as told by Hasmori et al (2012). The late payment issues in the construction industry are a global phenomenon.

2.12. CAUSES OF DELAY IN PAYMENTS

The root to understanding the inherent difficulties over payment lies in identifying the many complex factors that are present in the Industry. There are many factors that are said to be causing the delayed payment problems in construction industries (Nazir, 2006).There is a need therefore to identify the contributing factors which lead to a situation of delayed payments. Based on the literature review, various factors have been identified as the potential causes of delayed payment. These include: -

- Employer's poor financial management: It is anticipated that Employers' poor financial management could cause them to have insufficient operating funds when they are obliged to pay the payees. Payment is considered as the life blood of the construction industry because construction projects often involve very large capital outlay (Ameer-Ali, 2005), research conducted by the Construction Industry Development Board (CIDB,2006),

- Employer's withholding payment: As provided in many standard forms of contract, the Employer may withhold payment to the main Contractor or sub-Contractor for a variety of reasons. Such reasons are major defective construction work, disputed work, failure to comply with any material provision of the contract, third party claims filed or reasonable evidence that a claim will be filed, and failure to make timely payments for project resources (Reeves, 2003). These reasons may cause the Employer to refuse to make payments which will result in delayed payments.

- Conflict among parties involved: 'Payment, not unexpectedly, has always been the main subject of disputes' (Adballa and Ussein, 2002). It is anticipated that conflict if unsettled will escalate into disputes which can also cause delayed payment.

- The use of 'pay when paid' clause in sub-contracts:

The 'pay when paid' clause in contracts could cause delayed payment issues especially to the sub-Contractors (Ameer-Ali, 2005).

- Local culture/attitude: Before the introduction of the Housing Grants, Construction and Regeneration Act 1996 (HGCRA) the construction industry in the UK was prone to a culture of late payment where a delay of 53 days in making payment after the receipt of invoice was not uncommon (Johnston, 1999), research conducted by the Construction Industry Development Board (CIDB) of Malaysia (2006).

Other causes of delayed payment identified by the Construction Industry Development Board (CIDB) of Malaysia (2006) include:

- Employer's failure to implement good governance in business.
- Delay in certification.
- Under payment of certified amount.
- Pending variation orders approval.
- Disagreement on the valuation of work done.
- Money used up to other purpose.
- Consultants' working culture/Attitudes.
- Economic slow down

- Employer's ill intention to delay payment when work is completed, that is, when the Contractor has lost all commercial leverage in the contract.

Undoubtedly, the process of construction is complicated and fragmented. It involves many different commercial parties operating in supply chain under a range of contractual arrangements where risks are shared throughout the supply chain, Pettigrew .R. (2005).

In a developing economy, such as Ethiopia, the construction industry is made up of a large number of small and medium-sized indigenous firms and a small number of large dominant companies. The hierarchical structure of the industry's contractual framework makes it particularly susceptible to the poor payment practices that it adopts. The wide range of parties involved in the construction process, the unequal commercial bargaining power of large as opposed to small companies and the cascading system of contracts among those parties, meant that using contractual provisions to delay payment was easy, Lip, Euginie, (2006).Project personnel changes, poor documentation, no written instruction and incomplete or unavailable information are often cited, as the reasons when pressured to bring the accounts to conclusion.

Delay in finalizing variations and accounts serve no one's interest in time and expense, Lip, Euginie (2006). In some projects, particularly public projects, bureaucratic procedures contribute to delayed payment. Consequently, the average indigenous Contractors make monetary provision in their tenders to narrow the gap between period of certification of work executed and receipt of actual payment as a stop-gap measure. This contributes to high cost of projects. A few works published on this issue worldwide have stated that the delayed payment problems could be due to Contractors, Clients and sometimes the contractual matters in the contract provision used. (Reeves, 2003; Adballa and Hussein, 2002; Artidi and hotibongs, 2005).

2.12.1. DELAY IN PAYMENTS CAUSED BY CONTRACTORS

Most of the time, Contractors would blame Clients when they receive late payment; however, Contractors also contribute to this situation. In his work, Reeves (2003) stated that "one of the main reasons for delayed payment is when there are errors in submitting claims. This includes claims without adequate supporting documents, wrongly calculated" Claims and those submitted without using the correct procedures.

When this is the case, Contractors need to resubmit the claims after making the necessary corrections. Another factor contributing to delayed payment is when Contractors fail to agree with the valuation of work on site (Adballa and Hussein, 2002).

This would then result in conflicts between Clients and Contractors which could lead to dispute resolution and hence, delayed payment occurring.

2.12.2. DELAY IN PAYMENTS CAUSED BY CLIENTS

According to Reeves (2003), the main factor contributed by Clients is when they take longer than the stipulated time in terms of the contract to certify the claim. This might be because they have become increasingly subject to claims arising out of their design and construction administration services. There are cases where clients are wrongfully withholding the payment. Most of them do this to obtain some kind of 'gift' from contractors once they disburse the payment (Adballa and Hussein, 2002). Hence, contractors often have to tolerate this kind of action in order to secure their payments which should not be happening.

In Ethiopia, according to Clause 60(1) of the MoWUD's Standard Conditions of Contract 1994, the Contractor shall submit monthly statement for progress payments after the end of each month and the Engineer shall, after checking and agreeing to the contents attach the statements to the Interim payment certificate.

According to Clause 60(2) of the MoWUD's Standard Conditions of Contract 1994, the Contractor will be paid monthly, within 30 days of the presentation of the Engineer's Interim Payment Certificate to the Employer, 100% of the estimated value of the work executed up to the end of the previous month, together with the value of materials on Site intended to form part of the permanent work as and from such time as they are reasonably, properly and not prematurely brought upon the Site but only if adequately stored and/or protected against weather or damage. However, Most of the Clients or the Employers do not affect the payment within the time stipulated in the standard conditions of contract.

There are also cases where Clients are wrongfully withholding the payment. Most of them do this to obtain some kind of 'gift' from Contractors once they disburse the payment (Adballa and

Hussein, 2002). Hence, Contractors often have to tolerate this kind of action in order to secure their payments which should not be happening.

2.12.3. DELAY IN PAYMENTS CAUSED BY CONTRACTUAL MATTERS

There are cases where contract agreements do not bring any justice to both main Contractors and sub-Contractors (Artidi and Chotibongs, 2005). One good example is when for instance, the 'pay-when-paid' clause is often used in contract agreements between main Contractors and sub-Contractors. (Adballa and Hussein, 2002). 'Pay-when-paid' or also known as 'back to back' method of payment never brings justice to the second parties (Artidi and Chotibongs, 2005). Often second parties would get delayed payment or even worse, no payment at all. But the real situation is, it still exists in the industry, often in the non-standard construction contracts.

It may be worthwhile to note that in England, this type of provision in construction contracts has been rendered unenforceable (Housing Grants, construction and Regeneration Act 1996). The policy of 'pay-when-paid' was also rejected during the drafting of Construction Industry Development Board in 2002 in Malaysia. The general Contractor uses these strategies to insulate his company from any liability in the event of being sued by sub-Contractors at any time or in the event of non-payment by the owner.

2.12.4. OTHER CAUSES

Like, delay in valuation and certification of interim payment by Consultant, involvement of too many parties in the process of honoring certificates, heavy workloads of Consultants to carry out evaluation for work done and Contractor's misinterpretation of Client's requirement of variation order, Time taken for approval of payment claims by the Contractor. In Ethiopian case, for example, Contractors sent claims for additional works to the Engineer's representative every month for approval.

According to Clause 52(5) of the MoWUD's standard conditions of contract 1994, "The Contractor shall send to the Engineer's Representative once in every month an account giving particulars, as full and detailed as possible, of all claims for any additional payment to which the Contractor may consider himself entitled and of all extra or additional work ordered by the Engineer which he has executed during the preceding month. No final or interim claim for

payment for any such work or expense will be considered which has not been included in such particulars. Provided always that the Engineer shall be entitled to authorize payment to be made for any such work or expense, notwithstanding the Contractor's failure to comply with this condition, if the Contractor has, at the earliest practicable opportunity, notified the Engineer in writing that he intends to make a claim for such work". However, the approval may take several days which affects the Contractor.

2.13. PAYMENT ABUSES' EXPERIENCE OF SOME COUNTRIES

In the U.K. between 1989 to 1994, over 35,000 businesses and companies became insolvent with almost half a million jobs lost. That experience and the Latham report eventually resulted in the drafting of the U. K security of payment Act. In New Zealand, similar insolvencies specifically in construction since 1998 for main contractors followed by consequential failure in number of sub-Contractors prompted serious action, which eventually resulted in the drafting of the New Zealand "construction contracts Acts 2002".

In Malaysia, findings of the Construction Industry Development Board (CIDB) through a survey extends the findings to projected estimates of delayed and non-payment from a sample of industry players providing information on payment between 2000 to 2006. It was reported that about 1600 of small Contractors were on the brink of bankruptcy, when several main Contractors failed to pay them for rural roads they had constructed, despite the fact that Government having paid the umbrella Contractors in full Sulhaini (2005).

Generally, it is traceable to the fact that the feature of small firms in the construction industry is that they operate with limited working capital, and rely on thecash flow from projects to pay their bills. Any disruption in the flow of money can cause financial hardship and even failure lower down the contractual chain Gow, p.w, (2006). This position also led to another crippling consequence; that of the insolvency. The main Contractor, at the apex of the contracting chain is the conduct for significant sum of money channeled from the Employer to those below. The insolvency of the main Contractors pushes other parts of the project chain into insolvency in turn others with in the chain are also faced with the prospects of losing their money Lip, Euginie (2006).It is not uncommon that a Contractor who has not been paid what is due threatens to suspend work under the contract until payment is made (Murdoch, and Hughes 1996). This

option is not helpful, without a clear contractual right to do so; the court may find him guilty of repudiating the contract.

Payment not unexpected has always been the main subject of disputes (Kennedy 2005). The construction payment problems have 'domino' effect on the payment chain of the construction project (Davis, Langdon & search consultancy 2003).Due to these conditions, payment default can possibly lead to formal dispute resolution. According to Bob, (2005) to recover payment due for over two years, a claimant was forced to commence litigation and this process is both costly and takes a long time". Due to late payment problems, some countries like U.K, Singapore, New Zealand and Australia have already legislated their construction specific statutory payment security regimes. Some of these countries learnt the consequences of payment default the hard way-slow and sudden insolvencies. Some scrambled to get statutory provisions after a few major disasters. These legislations purposely enact provisions to address issues on prompt payment in the construction industry, to eliminate poor payment practices and smoothen the Contractors' cash flow (Lip, 2005; Ameer, 2005).Statistics from South Africa (2005) shows that from 1995 to 2005, about 5,907 construction companies were formally liquidated.

The CIDB (2004) states that much more than 90% of the emerging black Contractors survived the first five years. The CIDB further highlights that 1,400 construction companies were liquidated over the past three years. Emerging Contractors feel that the banks are reluctant to deal with them unless exorbitant interest rates and through compulsory business management services. Complexity, risks involved in the construction industry have led to enormous failures especially in small Contractors and those small emerging Contractors Harbouring the wrong impression that there is quick money to be made are the mostly affected (Ngala, et al., 2005).

2.14. IMPACTS OF DELAY IN PAYMENTS

The consequences of unregulated payment system led the construction industry into dilemma of payment default. It is necessary to understand the structure of the industry and the way in which payment is distributed within a construction contract in order to examine properly the effects of payment default in the industry.

2.14.1 THE STRUCTURE OF A CONSTRUCTION CONTRACT

The structure of the traditional (Design-bid-build system) is illustrated in figure 2.1 below.

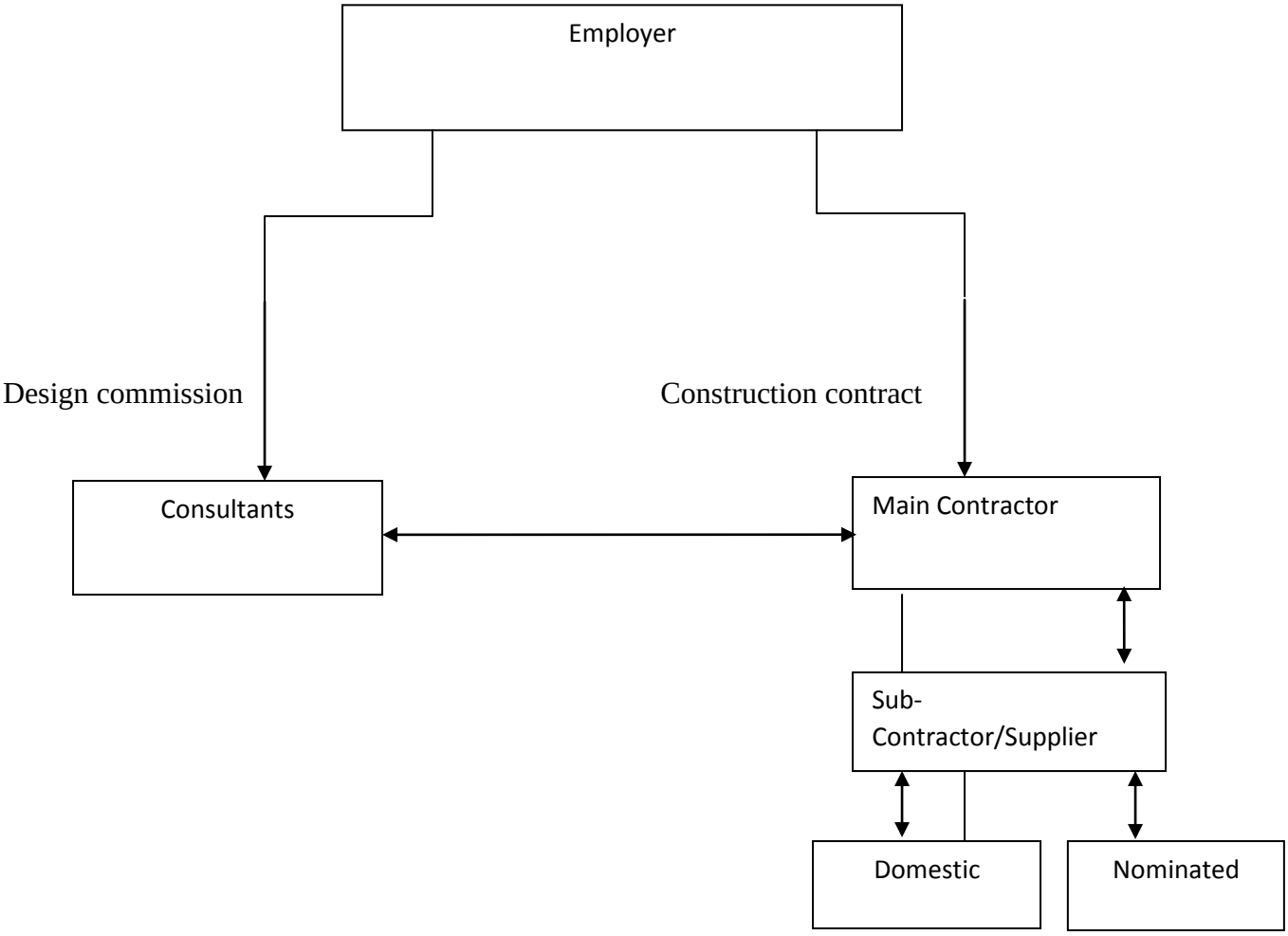

Figure 2.1-Source (Keith F. potts. 1995).

Under this system, the Employer desires to procure a facility (building project) and the Contractor undertakes to construct and deliver the completed facility and to be paid in accordance with the terms and provisions of the contract.

2.14.2. THE DISTRIBUTION OF PAYMENT AND RISKS

Generally, the distribution of payment within the construction project is from top of the pyramid to the bottom as illustrated in figure 2.2 below (Barley, 2006).

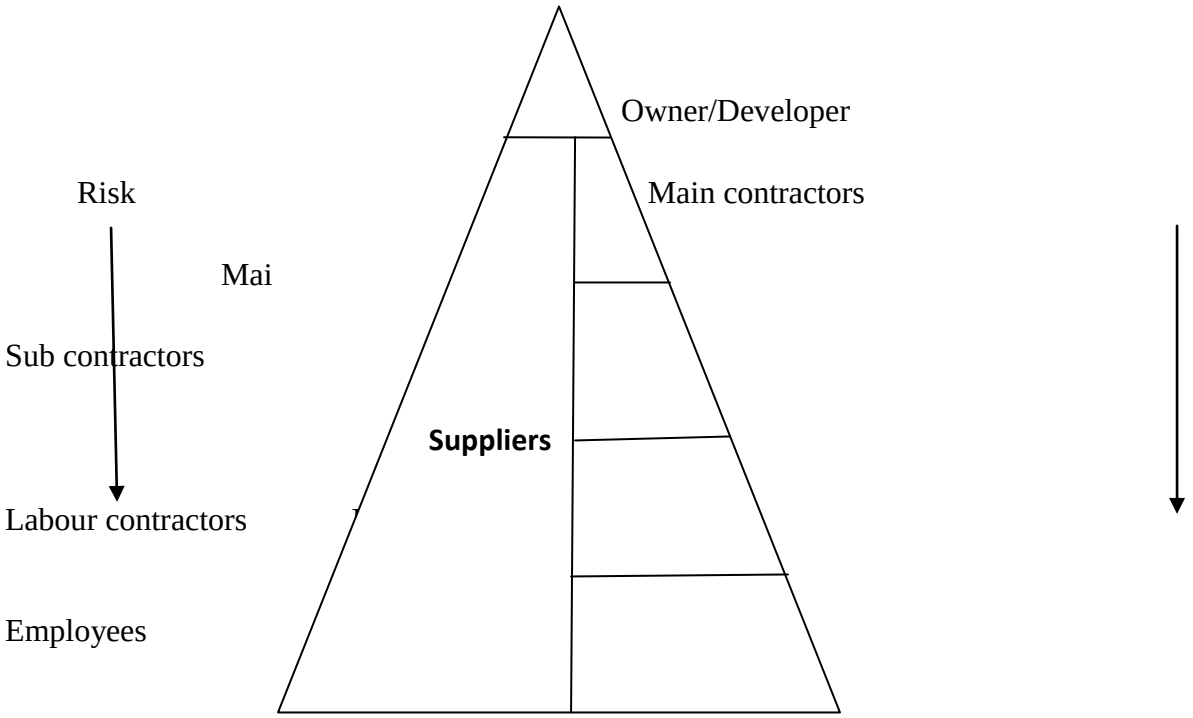

Figure 2.2 the chain of payment in the construction industry. Source: *Geoffrey Barley*. The New Zealand construction act 2002.

This implies that the payment chain starts with the Employer and passed to main Contractor and down to sub-Contractors and suppliers; down to labor Contractors and Employees at the bottom of the pyramid. The distribution of the risks is also in the same movement chain from the top of the pyramid down to the bottom. Payment delays have been widely recognized as a bane of the construction industry (Banwell 1964; Latham 1994; Kenley (cited in Gibson (2002); Cheng, Soo, Kumar Swamy, & Jin, 2009); Ye and Rahman (2010); Jin, Kumar Swamy et al (2011).

This has driven most countries to provide legal protection by declaring construction payment-specific security of payment Acts. For example, New Zealand declared the Construction Contracts Act (CCA) 2002 and enacted to improve cash flow to Contractors, following the

liquidation of many large construction companies that left several Sub Contractors unpaid (Degerholm, 2003).

Delay in interim payments and/orrelease of retention sums by project owners affect the cash flow of Contractors and which in turn affects other project participants down the supply chain. These practices often result in the insolvency of construction businesses operating at the lower end of the supply chain (Ang 2006; Wu, Kumar Swamy et al. 2008; Ye &Rahman, 2010). Sherindan (2003) identified the major causes of disputes in adjudication to be associated with the valuation of variations or final accounts and failure to comply with payment provisions. While failures to honour payments by construction Clients are caused by bankruptcy and liquidation/receivership of these Clients (Chilli Marketing, 2010). Other studies suggest that failure to pay for completed works, delays in payment by agencies to Contractors; improper financial and payment arrangements invariably result in project delays (Odeh&Battaineh, 2002; Alaghbari, Kadir, &alim, 2007). Very often payment delays which result in disputes drive construction parties to suspend and terminate projects.

The construction industry is notorious for its high rate of liquidation and insolvencies. At a larger scale, payment delays drive down the productivity of the industry. For example, the stoppage of material delivery to site due to non-payment to suppliers and late issuance of progress payments to main Contractors are the top most out of fifty factors that contribute to labour productivity (Kadir, Lee, Jafri, Sapuan, & Ali, 2005).

Delay in construction projects lead to serious consequences that may retard the development of the construction industry and influence the overall economic condition of a country (Abdul-Rahman et al., 2009). According to Abdul-Rahman et al. (2009), delay in the completion of construction projects could be the greatest cause for extra cost and loss in financial return or other benefits from project. Thus, delay is costly for both owner and Contractor.

To the Owner, a delay means loss of potential revenue, whereas to the Contractor, a delay means increased costs in overhead. Lip (2003) concluded that during the years, with the diminished volume of construction work, Contractors are reeling under relentless pressure to tender with little or non-existent margins or as most appropriately called 'suicide' bids just to sustain the flow of work orders. Payment to Contactors or lack of it is a common cause of disputes in the

construction industry. Timeliness of payments affects many Contractors, for whom receiving delayed payments from their Employers is a cause of friction between the two parties.

Meng (2005) in his works stated that all problems in construction begin when payment is not received at the exact amount or date. Disagreements then leads to arguments as relationships sour, and the stage becomes a setting for conflict, blame, finger pointing, buck-passing and lawyers. Projects exceed initial time and cost estimates and experience extensive delays. But Contractors are the ones who suffer the most when things like this occur. This is the case especially when Design and Built construction contracts are practiced more and more nowadays.

Contractors are highly dependent upon regular interim payments from Employers during the course of construction to help discharge the debt so accrued. Therefore, when a Contractor does not receive interim payments on time or in accordance with the terms agreed or for the proper amount, the interest he or she needs to pay in the form of finance charges to the bank will invariably increase. But then, the legal presumption is that in the ordinary course of things, a person does not suffer any loss by reason of the late payment of money; a presumption which is clearly fallacious in modern times. The basic common law is that interest is not considered to flow naturally from a breach, and therefore, cannot be claimed as general damages where the only breach is late or nonpayment was affirmed in London v Chatham and Dover Railway Company v South Eastern Railway Company (Rae, 2002). If this is thecase, it does not only burden the Contractor physically but mentally as well as he can't do anything about it. Sub-Contractors are also affected by late payments.

Sub-Contractors are often paid late by main Contractors because of pay-when-paid and pay-if-paid clauses included in most contract forms. The consequences of the sub-Contractors being paid late are grave. In such situations, some sub-Contractors tend to increase their quotations, which in turn increases total project cost, an undesirable condition for Owners. It should be possible to improve sub-Contractor payment practice if developers pay main Contractors on time and in turn main Contractors pay their sub-Contractors right after completion of sub-contract work. Other than that, late payment will also affect the Contractor's performance. He can lose his workers. He wouldn't have sufficient funds for the construction. The construction process will delay and the list goes on. But one thing for sure, it all brings negative influence to the overall construction process.

Coalition against payment delays in the construction industry conducted Impact Study on Payment Delays in the Quebec Construction Industry. Raymond Chabot Grant Thornton (RCGT) was mandated by the Coalition against payment delays in the construction industry (the "Coalition") to carry out a study on the issue of payment delays in the construction industry. The Coalition, representing a group of more than 20 associations involved in the Quebec construction industry, is concerned about the impacts of late payments on their respective members.

The analysis of the data gathered during the study enabled us to assess the economic impacts of payment delays on the Quebec construction industry. The impacts identified, including quantifiable economic and other impacts on Quebec, are as follows:

- Cash flow management:
  - ✓ An annual sum of more than $7.2 billion that companies are being deprived of beyond the usual payment period of 30 days, representing nearly 15% of all construction expenses;
- Financing costs: interest charges from accounts receivable beyond 30 days account for more than $137 million annually;
- Company productivity: loss in productivity due to late payment recovery representing more than $132 million annually;
- Delays in payment to suppliers (i.e., "pay-when-paid");
- Limited growth of businesses.

The total quantifiable impact is in excess of $1 billion annually.

According to Murdoch and Hughes (1996), 'it is not uncommon to find that a Contractor or sub-Contractor who has not been paid what his due threatens to suspend work under the contract until payment is made'. It must however be noted that without a clear contractual right to suspend the works, the Contractor is not entitled to do so even though the Employer has failed to pay him within the time stipulated in the contract. In this respect, if the Contractor suspends the work the courts may find him guilty of repudiating the contract. Late payments are often associated with other issues in Malaysia's construction industry such as productivity, non-conformance, safety, delay and abandonment issues (Oon, 2002).

The common mechanisms for dispute resolution in Malaysian construction industry are presently by way of arbitration and litigation. These mechanisms have always involved the judicial system

and a complex body of rules as to procedure. It is no secret that these mechanisms of dispute resolution leave much to be desired. Criticisms are frequently made as to its many inadequacies and shortfalls. Litigation is affordable but it takes too long. It may be heard after a long delay by a judge with little or no experience in the field of construction (Rajoo, 2003).

The possible impacts of delayed payment have been identified as follows:

- Creates financial hardship: It is anticipated that delayed payment can create financial hardships for the Contractor.
- Creates a negative chain effect on other parties: As stated by Davis Langdon and Seah Consultancy (2003), 'the construction payment blues have domino effects'. A delayed payment by one party may affect the entire supply chain of payment of a construction project.
- Creates cash-flow problems: It is universally accepted that delayed payment affects the Contractor's cash flow, which in turn can affect the progress of the works and profitability (Naseem, 2005).
- Results in a delay in completion of projects: according to Abdul-Rahman and Berawi, (2006), a financial problem is confirmed by the view of top management in the survey as being the main cause of delay, in addition to manpower shortage. Other possible impacts have been identified by the researcher, and include that delayed payment:
- Leads to bankruptcy or liquidation.

A failure on the part of the Employer to pay the Contractor in an efficient and timely manner may affect the Contractor's original financial plan. This could affect Contractor's cash flow which in turn, might lead to Contractor's insolvency due to unplanned cash flow problems. In the UK, during the early nineties, thousands of businesses and companies became insolvent with enormous numbers of job lost (Ameer, 2005). That was one of the reasons that prompted the Department of Environment to produce Latham report. Constructing the team which reviewed the procurement and contractual arrangements in the UK construction industry and provided recommendations to improve its performance. Some of the recommendations were adopted which resulted inthe drafting of the UK Construction Contracts Act, known as the Housing Grants, Construction and Regeneration Act 1996.

In New Zealand, insolvencies specifically in the construction industry were spread throughout the country and some involved major companies (Ameer, 2005). Again, the introduction of

Construction Contracts Act was seen as the remedy to address the insolvency problem that resulted in the drafting of the New Zealand Construction Contracts Act 2002. Contractor's liquidation will severely affect the Contractor's performance in completing the work which will result in the abandonment of projects.

- Leads to abandonment of projects.

Delayed payment may cause abandonment of projects. This is due to no sources of money to pay for the labours, materials, plants and equipment involved in the project. Until certain stage, the main Contractor will not be able to cope with the problems and will normally take action to stop work until the Employer paid them the monies due. Worse still, the Contractor may go into liquidation due to the failure on his part to meet the claims substantiated by his Bankers, sub-Contractors and suppliers. This will surely lead to the abandonment of projects. Inevitably, disputes will crystallize and both parties will resort to dispute resolution process.

- Results in formal dispute resolution, e.g. litigation/arbitration.

A failure on timely payment could possibly lead to formal dispute resolution. According to Bob (2005), in the past, to recover payment, the claimant was forced to commence arbitration or litigation; those processes are very costly and take a long time. The effects of late and non-payment do not end here; it may in certain circumstances create negative social impacts as discussed in the following sub-section.

- Creates negative social impacts.

According to the researcher's observation, if construction delays are caused by the late payment, buildings such as the car park of a medical centre, students' residential flats and so on could not be put into use on time. These will cause problems such as patients could not be healed in time, new students have troubles in finding a house, and so on. If delay caused by this reason happens in the road and bridge projects, traffic problems may arise.

2.15. PREDICTING COST AND TIME OVERRUNS

The accuracy of early cost estimates in engineering and construction projects is extremely important to both owners and project teams (Oberlender and Trost, 2001). Decision making in the early stage of a project has a significant impact on the project. To evaluate alternatives, quick and accurate decision making is needed under a limited definition of scope and constraints in available information and time (Kim, K. J., and Kim, K, 2010). However, limited and uncertain

information on the project and a complex correlation among various factors that affect the project's construction cost makes it difficult to predict and manage pertinent task (Koo, C.W.,Hong, T., Hyun, C., and Koo, K,2010).

Several studies have attempted to determine the factors creating risk for construction projects. Kangari, R., 1995 has conducted a survey to study the risk attitudes of large U.S. construction firms. Among the 23 risk factors included in this survey, labor, equipment and material availability, labor and equipment productivity, defective design, changes in work, differing site conditions, safety, delayed payment on the contract, and quality of work were presented as risks with high importance. Ibbs, W.C., and Ashley, D.B., 1987 focused on the contract related factors which play an important role in the allocation of risks between the owner and the contractor. Sonmez,R., Ergin, A., and Birgonul. T., 2007 explained that country risk rating, material availability, type of contract, advance payment was the major factors impacting contingency decisions of the contractors. Trost, S., M., and Oberlender, G., D., 2003 developed a multivariate regression model to predict cost estimate accuracy for capital projects.

The previous studies used various methodologies to solve the problem of predicting construction cost, cost contingency, and cost overrun for construction projects. Some of the methods used in the previous studies include:

- Statistical methods such as multiple regression analysis (MRA) for predicting construction cost (Abu Hammad, et.al, 2008). Attala, M., and Hegazy, T., 2003presented a regression model for predicting cost overrun of reconstruction projects. Trost, S., M., and Oberlender, G., D., 2003 presented models for predicting cost contingency.

- Repetitive learning methods such as artificial neural networks (ANN) for predicting construction cost (Dogan, S.Z, Arditi, D., and Gunaydin, H.M., 2006). Attala, M., andHegazy, T.,2003 presented an ANN model for predicting cost overrun of reconstruction projects in addition to the regression analysis mentioned above.

- Stochastic methods such as Monte- Carlo simulation (MCS). Nassar, K.M., Gunnarsson, H.G., and Hegab, M.Y., 2005 conducted a simulation model for predicting the construction cost.

- Analogical methods such as Case-based reasoning (CBR) for predicting the construction cost (Ji, S.H., Park, M., and Lee, H.S., 2011).

Koo, C.W., Hong, T., Hyun, C., and Koo, K.,2010 stated that such methodologies have distinct characteristics in terms of applied fields, analysis of data, methods of system establishment, and types of results. Multiple regression analysis arrives at the result through statistical analysis

Artificial neural networks are more accurate than MRA, but it has a black box that cannot explain the structure of the model. Monte Carlo simulation has the function of analyzing the outlier using the probability approach (Koo, C.W., et.al. 2010). In their work, Kholif, Hosny and Sanad (2013) conducted an analysis of time and cost overruns for a sample of 102 educational projects. They showed that about 32.35% of the selected projects have exposed to cost overrun. On the other side, time overrun was only noticed on about 28.43% projects. The average percentage of the actual cost overrun was found to be inversely proportional to the project size. They developed regression models for cost and time overruns.

They tested the validity of these models which assessed in expected cost and time overruns for any future projects at level of confidence 96.67% and 94.88% respectively.

2.16. REMEDIES FOR DELAY IN PAYMENTS

All standard forms of contract provide a period of time, which is referred to as period of honoring certificate, for the Employer to pay for the total value of work executed plus unfixed materials and goods to the Contractor. The period of honoring certificates depends on the Kind of standard form of contract adopted. Failure on the part of the Employer to pay the Contractor within this period will constitute a breach of contract. Generally, the fact that a breach of contract has been committed does not automatically bring the contract to an end. Parties to a contract are bound by the terms, to which they have agreed, and e.g. the case of delayed payment by the Employer does not give the Contractor the right to treat the contract as being at an end; it is regarded as a minor or normal breach. Thus, the contract still subsists and the Contractor is obliged to proceed with the carrying out of the works regularly and diligently and of course in a good and Work-like manner (Articles of Agreement and Condition of Contract for Building Works, 1988).

Lim (2005), has indicated that there are various avenues available to improve the problem of delayed payments in the industry and some of these options have been incorporated in the construction contracts or statutes in the other developed countries, such as payment of stipulated interest, suspension of works, right to slow down work, eradication of the 'pay-when-Paid' clause, right to refer dispute to adjudication, the creation of right to a lien and creation of payment bonds.

2.16.1 REMEDIES EXPERIENCE OF DIFFERENT COUNTRIES

Multiple parties are at risk of delayed payment within the supply chain on any construction project. Yao (2014) suggests that risk should be evenly allocated and enforced among all parties involved; actions that can help foster trust among owners and contractors (Ramachandra&Rotimi, 2011). Construction companies have a desire for external assistance to reduce debtor time to pay via legislation (Peel et al., 2000) Other countries (e.g., Australia, New Zealand, United Kingdom, United States of America) have already adopted prompt payment legislation. Geographically, legislation differs drastically; however, multiple aspects are taken into consideration. In New Zealand, strategies to secure payment include; regulation around placing change orders, registering interest over properties, lodging bankruptcy and liquidation proceedings, holding money in a trust account, and direct payments made by sureties (Ramachandra&Rotimi, 2011).

In Australia, the prompt payment act enables contractors to receive progress payments, charge interest on late-payments, provides the right to suspend or lien work, voids pay-when-paid clauses in contracts, and rapid independent dispute adjudication (Brand &Uher, 2010; for additional regulations in other countries, see Prism Economics and Analysis, 2013). Follow-up studies on the success of prompt payment legislation in Australia observed fewer late payments, increased reporting of never having late payments, and an increased sense that the act helped create a fair and balanced payment standard. Another success of the act was increased communication between parties and opportunities for early dispute avoidance and resolution as a result of the act (Brand &Uher, 2010).

2.16.2. CONTRACTUAL REMEDIES FOR DEFAULTS OF PARTIES

The construction contract is unique in that it seeks to provide for a specific remedy in the event ofany breach of the terms and conditions within its framework and/or for a contractual entitlement inrespect of specified events. Therefore, it is essential that the parties and those who represent themfully comprehend the terms of the contract and the remedies available to them under it. Basically, As John Murdoch and Will Hughes (2000) stated, the parties to the contract are obligedto carry their obligations to their conclusion, unless there are express clauses setting outcircumstances relieving them of this obligation. Most general contracts carry such clauses, forexample, giving an Employer the power to determine the Contractor's employment if the Contractor;fails to make regular progress, suspends work or becomes insolvent. Similarly, a Contractor mayhave the right to determine the contract if an Employer obstructs the issue of certificates, continuously suspends the works or becomes insolvent. Such determination can only take placewithin the express terms of the contract. The absence of such terms would leave the parties reliantupon common law remedies.

Under the MoWUD condition of contract, clause 69(1) default of the Employer, it is stated thatIn the event of the Employer:-

- Failing to pay to the Contractor the amount due under any certificate of the Engineerwithin thirty days after the same shall have become due under the terms of thecontract, subject to any deduction that the Employer is entitled to made under thecontract, or
- Interfering with or obstructing or refusing any required approval to the issue of anysuch certificate, or
- Becoming bankrupt or, being a company, going into liquidation, other than for thepurpose of a scheme of reconstruction or amalgamation, or
- Giving formal notice to the contractor that for unforeseen reasons, due to economic dislocation, it is impossible for him to continue to meet his contractual obligations the Contractor shall be entitled to terminate his employment under the contract after giving thirty days' prior written notice to the employer with a copy to the Engineer.

2.16.3. PAYMENT OF STIPULATED INTEREST

In Ethiopia, under sub clause 43.1 of the PPA conditions of contract, it is stated that if the Employer makes a late payment, the Contractor shall be paid interest on the late payment in the next payment. InMalaysia, only Sub-clauses 42.9(b) and 42.12 of CIDB 2000 form comprehensively provides entitlement to claim for interest due to Employer's delayed and unpaid payment as well as for any failure or delay by the Superintendent Officer in certifying any payment due. Such an express provision is essentially required in order to avoid disputes on this issue especially, if it goes to unnecessary expensive arbitration or litigation proceedings.

In Ethiopia, there is no law that supports to suspend work due to late payment. It is universally known that there is no common law right of suspension of work due to delayed payment. The Contractor is obliged to proceed with the work in a regular and diligent manner notwithstanding the fact that he is not being paid for the works he has executed previously. For example, the Court of Appeal of New Zealand in the case of British Pipe Lines vs. Christchurch Drainage has held that a Contractor has no implied right of temporary suspension following delayed payment on the part of the Employer. The decision was subsequently followed in the English case of Lubenham vs. South Pembrokeshirewhich affirmed the position of Contractor's right of suspension.

According to Murdoch and Hughes (1996), 'it is not uncommon to find that a Contractor or sub-contractor who has not been paid what is due threatens to suspend work under the contract until payment is made'. It must be noted that without a clear contractual right to suspend the works, the Contractor is not entitled to do so even though the Employer has failed to pay him within the time stipulated in the contract. In this respect, if the Contractor suspends the work, the courts may find him guilty of repudiating the contract. This will in turn open for the other party to accept the repudiation and rescind the contract and sue for damages.

Hypothetically, a Contractor is only entitled to suspend the works following non-payment if such a stipulation is expressly spelled out in the contract. However, the right to suspend the works can only be found in CIDB 2000 only. For example, Clause 42.10 states that if the Employer fails or neglects to pay the Contractor the amount on any certificate within the Period of Honouring Certificate, and continues such default for fourteen (14) days, the Contractor can give a notice

specifying his intention to suspend the execution of the works. If the Employer still continues such default for another fourteen (14) days after the receipt of the notice, the Contractor can suspend wholly or partly the execution of works or reduce the rate of execution of the works.

The duration of the suspension of work by the Contractor is deemed as a period of extension of time that will be added to the original completion period and loss suffered is compensable. Having discussed the importance of such right, it is appropriate to include this provision in all the standard forms available in Ghana. Perhaps by including this provision in the Ghanaian Construction Contracts Act in the future, it would force the incorporation of the right to suspend the work in all the standard forms of contract, because once the Act is in force it will provide certain mandatory requirements that must be followed by any construction contract that falls within the ambit of the Act, failing which a default scheme will kick in and both parties in the contract must comply with it.

In the UK, Section 112 of the HGCRA provides that when the sum is not paid on the final day of payment and no withholding notice has been issued by the Employer, in this circumstance, the Contractor is entitled to suspend his performance until the full payment is paid but strictly subject to the issuance of 7 days' notice stating his intention in suspending the work and grounds of suspension. If the Contractor feels that it is inappropriate or impractical to suspend the work, the alternative available at the Contractor's disposal is to slow down the work.

2.16.4. RIGHT TO SLOW DOWN WORK

According to Lim (2005), right to slow down the execution of the work is also not recognized under the common law apart from the right to suspend the work. Currently, in any Construction Contracts Act around the globe, such a right is excluded. It is a sensible approach to include that provision in the Ghanaian Construction Contracts Act as sometimes it is not worthwhile for the contractor to suspend the work altogether because there is a situation whereby the machinery and equipment left idling on site and the fact that the contractor is obliged to pay for the hiring cost.

2.16.5. THE CREATION OF A RIGHT TO A LIEN

The problem of the security of payment by the Contractor to the Client is extensively dealt with by way of mechanic lien statues in USA and Canada, which is currently absent in Ethiopia. In defined term, Lien is a right to take and hold or sell a property of a debtor as security for a debt

until payment is made. Theoretically, any unpaid Contractor who has provided labour or materials in constructing building or road has the right to exercise lien and then sells the building and utilizes the amount of payment received to his benefit and the remainder will be returned to the debtor. This provision is currently absent in any Construction Contracts Act in the world and would be a very good remedy for the recovery of delayed payment or non-payment. This right has proved to be successfully implemented in the USA and Canada in securing payment debt.

2.16.6. PAYMENT BOND

The payment bond is a straight forward devise basically requiring a third party such as bank or an insurance company to guarantee payment in the event of default on the part of the paying party (Lim, 2005). Basically, it requires the party awarding a construction contract in excess of certain amount to provide a payment bond to the Contractor. The concept is similar to performance bond, but, the obligation lies on the Employer to obtain the payment bond. It should also be noted that the Contractor shall not be entitled to commence the work unless the payment bond is received. The mandatory inclusion of this provision in all the standard forms available could provide a safety net to the Contractor in the event of delayed payment.

CHAPTER THREE

3.0. MATERIALS AND METHODS

3.1. INTRODUCTION

This chapter presents the methodology adopted and identifies the tools and techniques employed in conducting the study. The methodology describes the practical way in which the whole research project has been organized (Oliver, 2004). Methodology is a plan of action that shows how the problems will be investigated, what information will be collected using which methods, and how this information will be analyzed in order to arrive at conclusions and develop recommendations. Research follows some steps and procedures when conducted. Once the problem statement has been formulated, it should become evident what kind of data will be required to study the problem, and also what kind of analysis would be most appropriate to analyze the data (Walliman, 2005).

3.2. RESEARCH APPROACH

The method used to collect information for this study was the questionnaire survey. The choice of using this method was made based on a variety of factors, including the type of information to be gathered and the need to protect the privacy of the participants. Often, confidentiality is necessary to ensure that participants respond honestly. Since the subject of the research is payment, confidentiality is very necessary. Again, the questionnaire survey was deemed as being the most appropriate way in gathering all the information from different parties for this study. The questionnaire was designed according to the objectives of the research by reviewing literature dealing with delayed payment and other relevant topics. The study used the data sources to produce the following basic documents:

- Respondents' documents: The respondents' documents were collected using questionnaires from Clients (Project owners),Contractors andConsultants.

Archival documents: Archival documents are mostly from completed projects, in whichcontract documents, project reports, correspondence letters and payment certificates are investigated and which arevery important in identifying the recurrent problems related to delayed payments in the Ethiopian building and road construction sector. In addition, it will help to judge how problems on delayed payments arise and how it is documented.

Questionnaires are distributed by contacting face to face and with self-addressed envelopes or e-mailed to the respondents. This had been done in order to ensure that the targeted persons received the questionnaires and to collect easily the completed forms after wards.

In this research, a predictive regression model is applied for predicting effects of delayed payment particularly on cost and time overruns percentage of building and road construction projects. As an initial step to meet the objectives, Literature reviews that deal with causes (factors) ofdelayed payments in construction projects were reviewed in previous section to investigate the most significant factors of delayed payments. A list of factors of delayed payments in construction projects is prepared to collect data about the significance of these factors through questionnaire survey. The next step was to analyze the survey results to obtain the most significant causes of delayed payments that are used to build regressionmode landpredicted the percentage of cost and time overruns impacted by the most significant factors of delayed payments.The last step of this research was validating the regression model.

3.3. QUESTIONNAIRE

The questionnaire isprepared according to the objectives of the research by reviewing literature dealing with delayed payment and other relevant topics. The questionnaire was intended to:

- Identify the responsible parties to the causes of delayed payments
- Analyze the effect of the delay of payment on the cost overrun of the projects.
- Analyze the effect of the delay of payment on the time of completion.
- Identify causes or factors for establishing a tool or that can predict the effects of delayed payments on the performance of building and road projects.
- Formulate a Tool that can predict the effects of delay in payments on the performance of building and road projects, that is, on the cost overrun and time of completion.

3.4. TARGET RESPONDENTS

A questionnaire survey was conducted on the targeted groups, i.e., on Contractors, Consultants and Clients with classification of Grade 1 contractors and consultants. Theseclasses are chosen for the study because of the large projects they undertake. Also, these companies under these classifications are relatively well organized in terms of planning of their projects and the large projects undertaken (in terms of size and quantity) which makes them highly affected when it

comes to delayed payment. This was therefore achieved by acquiring initial list of Contractors and Consultants within the classification from the Ministry of Works and Urban Development.

3.5. DATA COLLECTION

The survey was carried out to obtain indicative data from carefully selectedrespondents of Building and Road construction projects in Ethiopia. In order to achieve the objectives, the study focused on Contractors, Consultants and a few Clients in Road and Building projects. This is because they are those who are directly confronted with these issues as they occur in the Construction industry. Based on the objectives and the research questions, a questionnaire is developed to obtain data which is practicable. A structured questionnaire is therefore prepared and distributed to the various respondents. The questionnaire consisted of closed and opened ended questions.

For the purpose of the study, the questions were grouped under four categories. The first series of questions related to respondent's profile. This was intended to find out the background and experience of respondents. The second series of questions is to find out the causes of Delay in payments, the third series of questions is to find out the effects of delay in payments and the fourth series of questions related to remedies to be taken on the delay in payments. The questionnaire is mainly based on Likert'sscale of five ordinal measures from one (1) to five (5) according to level of agreement. Likert's-scale helps to know respondents' feelings or attitudes about an opinion. The respondents must indicate how closely their feelings match with the question or statement on a rating scale. Identifying the variables of the causes and effects of delayed payments, respondents are then asked about their agreement on these variables. Accordingly, the respondents would choose one of the following based on their outlook.

Table 1 - Scales that represent chances of occurrence of causes of delayed payments

Statement	Scale
Strongly agree	5
Agree	4
Neutral	3
Disagree	2
Strongly disagree	1

In the second part, the factors compiled in the form of two priority scaling, one for occurrence of frequency, while the other for severity scaling. The priority scaling for occurrence of frequency was as follows:

Table 2- Scales that represent chances of occurrence of frequency of causes of delayed payments

Statement	Scale
Always	5
Often	4
Usually	3
Sometimes	2
Scarcely	1

The priority scaling for degree of severity was as follows:

Table 3: Scales that represent chances of degree of severity for the causes of delayed payments.

Statement	Scale
Very severe	5
Severe	4
Somewhat severe	3
Little effect	2
Very little effect	1

The participants were asked to assign a number from 1 to 5 to each cause for both occurrence frequency and severity according to its significance.

3.6. POPULATION DEFINITION

The selection of the respondents was limited to only Grade 1 Road and Building Contractors and Consultants in Ethiopia. These Contractors and Consultants are selected from Ministry of Works and Urban Development (MoWUD) Classification of Contractors and Consultants. The choice of these classes of Road and Building Contractors are made on the basis that they are easy to locate and are more exposed to delayed payment.

An aggregate population sum of forty three Road and Building Contractors, nine Consultants and fiveClients are randomly selected within the study area for information regarding payment issues since they are the principal Employers. The respondents wereasked to express their perceptions of the causes of delayed payment and i m p a c t s thereof. The total population size is 57.

3.7. SAMPLE SIZE DISTRIBUTIONS

Wood and Haber (1998) defined sampling as the process of selecting representative units of a population for the study in research investigation. A sample is a small proportion of a population selected for observation and analysis. The samples were selected from contracting companies and consultant offices whose data were selected from the Ministry of Works and Urban Development (MoWUD).Statistical equations were used in order to calculate the sample size.

In total, the number of Contractors, Consultants and Clients on which the study was undertaken is summed up to Fifty seven (57).

Using theKish formula (1965), the sample size is:

$$n = \frac{n^1}{1+n^1/N} \quad (1)$$

Where n=sample size.

N = Total population size (the number of Grade one Road and Building Contractors in Ethiopia).

N =129 (No. of grade 1 BC and GC Contractors and Consultants taken from the classification list of the Ministry of Works and Urban Development).

$$n^1 = \frac{S^2}{V^2} (2)$$

s= maximum standard deviation in the population of elements. (Total error of 0.1 at a confidence interval of 95%).

v= standard error of the distribution assumed to be 0.05.

s^2 = p (1-p) where p is the proportion of population elements that belong to the defined class.

$$S^2 = 0.5(1 - 0.5)$$

$$S^2 = 0.25$$

$$n^1 = \frac{0.25}{0.05^2}$$

$n^1 = 100$

$n = \frac{100}{1+(100/129)}$ =56.3 = 57

In order to get a thorough representation of the sample size, the distribution of the questionnaires is conducted to both Consultants and Contractors of grade one category considering of experience and reputational diversities within the construction industry.

3.8. QUESTIONNAIRE DISTRIBUTION

After determining the research sample size, a total of 57 questionnaires were distributed and delivered in person to the representatives of the three target groups (the Employer, the Contractor and the Consultant) of the projects under study. So, the questionnaires were distributed to the representatives of each party and who have a direct involvement and believed to have sufficient know-how. For the sample determined, five questionnaires were distributed to the Employer which is 8.77 % of thetotal number of questionnaires, forty threeof the questionnaires which are 75.44% of the total, were distributed to Contractors of the projects and nine questionnaires which constitute 15.79 % ofthe total questionnaires were distributed to the representatives of consultants of the projects.

The respondents of the questionnaires were professionals with a minimum experience of three years and maximum of thirty years with different responsibilities in the projects under study which includesProject Managers, Project Engineers, Site Engineers, Quantity Surveyors and the Employers' and Consultants' representative Engineers.

3.9. METHOD OF ANALYSIS

The data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 20 to indicate the level of agreement or significance of each question. The statistical method which is used in analyzing the data obtained from the respondents is as follows:

- Degrees of freedom (df) are often broadly defined as the number of "observations" (pieces of information) in the data that are free to vary when estimating statistical parameters. Degree of freedom = n-1, where n = Sample size (i.e., number of observations).
- T-test is commonly used to determine whether the mean of a population significantly differs from a specific value (called the hypothesized mean) or from the mean of another

population. The t-test calculates a t-value. (The p-value is obtained directly from this t-value.)

$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} \qquad (3)$$

Where:

μ = Proposed constant for the population mean

$\bar{x}$ = Sample mean

n = Sample size (i.e., number of observations)

s = Sample standard deviation

Degree of freedom = n-l, where, n is sample population and 1 is constant.

P is calculated statistical significance value.

In order to assess the significance of the identified causes, an Importance Index for each factor was calculated, as illustrated in Eq. (4) below, by multiplying the frequency of occurrence by the degree of severity or impact. Frequency occurrence refers to the probability that any cause given occurs in a project and contributes to its cost overrun. Whereas, degree of severity refers to the negative impact that the cause contribute to the project cost or time overrun. The importance indices were used to measure the relative weight for each factor. The relative importance weight (RIW) was computed using Eq. 5 below. The cause financial condition of the Client, for example, if it's assigned (4=often), for frequency of occurrence, this means that the interviewer assigns 80% probability for the occurrence of this factor effect in previous projects according to his experience. In these projects this cause contributed to these projects cost and time overrun. On the other hand, if this factor assigned (4=severe) for the degree of severity, this means that the impact of this factor was severe on these projects' cost or time overrun.

Important index (II) = Occurrence frequency*Degree of severity (4)

Relative Importance Weight (RIW) = $\frac{\Sigma\, \Pi * \text{corresponding no. of respondents}}{\text{Total no. of respondents}}$ (5)

Where:

II is Occurrence frequency * degree of severity

Corresponding no. of respondent are the no. of respondents to the corresponding cause or factor that the relative importance weight (RIW) is given.

Total no. of respondents is the no. of respondents who responded the questionnaire.

CHAPTER FOUR

4.0. RESULTS AND DISCUSSION

4.1. INTRODUCTION

In this chapter the data collected from the questionnaire surveys and interview were analyzed and interpreted. The data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 20 to indicate the level of agreement or significance of each question. The findings were also discussed to give better reflections on the proposed study.

4.2. RATE OF RESPONSE

The respondents were grouped into three major groups namely Clients, consultants andContractors. Out of 57 targeted responses, only 38 (66.67%) of them responded the questionnaire. Thirty-eight questionnaires from two clients, two consultants and thirty four Contractors' representatives were received.This response rate is considered acceptable for a survey focusing on gaining responses from industry practitioners. (Alreck and Settle, 1985). The limitation of this response rate isthat it is contractors' biased assessment because the vanguard victims of the delayed payments are Contractors.

4.3. RESPONDENTS' BACKGROUND AND EXPERIENCE

Table 4 below presents respondents' background and experience in accordance with their position and work experience. The respondents have different levels of work experience in building and road projects. Proportions of the respondents in terms of number of years of involvement in building and road projects are tabulated in Table 4 below. It was observed that the majority of the respondents have above ten years of experience.

Table 4- Respondents background and experience

Item	Response	Frequency	Percent
Position of the respondents	Project manager	1	2.63
	Project Engineer	15	39.48
	SiteEngineer	10	26.32
	Quantity surveyor	8	21.05
	Clients	2	5.26
	Consultants	2	5.26
	Total	38	100.00
Respondents work experience in construction.	3 – 10 years	18	47.37
	10-15 years	15	39.47
	Above 15 years	5	13.16
	Total	38	100.00
Companies work experience in construction works.	6-10 years	8	21.10
	More than 10 years	30	78.90
	Total	38	100.00

An analysis of the respondents indicated that, the respondents are from Grade one GC/BC/RC of Foreign and Local building and road contractors and Consultants.

Among the two responses received from clients, two (100.00%) of them were not Engineers. They are follow-up representatives. Among the two responses received from consultants, two (100.00%) of them were resident Engineers. Among the thirty-four responses received from Contractors, one (2.94%) of them wasProject Manager,fifteen (44.12%) of them were Project Engineers,ten (29.41%) of them were Site Engineers and eight (23.53%) of them were Quantity Surveyors.

4.4. FINDINGS FROM THE QUESTIONNAIRES

The list of factors presented in the questionnaire which contributed to the causes, impacts and remedial measure of delayed payment were obtained from previous works.

Findings of the survey were analyzed to provide a better understanding of the issues of delayed payment in the construction industry. The results of this study were generated from all the responses received and discussed based on the categories provided in the questionnaire as follows:

4.4.1. CAUSES OF DELAYED PAYMENTS

This division discusses the factors that caused delayed payments problems. The respondents' responses are divided into four groups which are Contractor,Client, Contractual and Consultant related factors. Each of these categories was then analyzed and the results are shown in Tables 5, 6,7 and 8.

Table 5 below presents respondents' response on contractor related factors which contribute to the delay in payments. These factors are found from the Literature review as causes for delay in payments and are also practically seen as causes for same from the respondents in Ethiopian building and road construction industries. The respondents' responses are rated by using the Likert scale so as to identify the significant factors for the analysis of the regression model.

Table 5 - Responsesto the causes of delay in payments by contractor related factors.

No	Hypothetical statement	Response	Frequency	%	Calculated Mean	t	df	P-Value
1	Contractors delay in submitting claim	Strongly disagree	10	26.3	2.7895	11.529	37	0.000
		Disagree	8	21.1				
		Neutral	8	21.1				
		Agree	4	10. 5				
		Strongly agree	8	21.1				
		Total	38	100				
2	Requesting payment for defective works	Disagree	12	31.6	3.00	19.856	37	0.000
		Neutral	18	47.4				
		Agree	4	10.5				
		Strongly agree	4	10.5				
		Total	38	100				
3	Contractor submits claims without adequate supporting documents	Disagree	4	10.5	4.00	26.514	37	0.000
		Neutral	4	10.5				
		Agree	18	47.4				
		Strongly agree	12	31.6				
		Total	38	100				
4	Contractor's failure to agree to the valuation of work	Disagree	8	21.1	3.5789	18.580	37	0.000
		Neutral	4	10.5				
		Agree	22	57.9				
		Strongly agree	4	10.5				
		Total	38	100				
5	Contractors' failure to understand the contract agreement	Disagree	14	36.8	3.2632	18.580	37	0.000
		Neutral	4	10.5				
		Agree	16	42.1				
		Strongly agree	4	10.5				
		Total	38	100				
6	Contractor suspension of work	Disagree	18	21.1	2.9474	16.032	37	0.000
		Neutral	8	21.1				
		Agree	8	47.4				
		Strongly agree	4	10.5				
		Total	38	100				
7	Insolvency/bankruptcy of the contractor	Disagree	16	42.1	2.6842	24.998	37	0.000
		Neutral	18	47.7				
		Agree	4	10.5				
		Total	38	100				

Source: Field survey 2016 computed by SPSS

From the analyses made above in Table 5, Respondents gave different levels of scales. The calculated p-values for all hypothetical statements were 0.000 which are less than the statistical significant value 0.05 ($P<0.05$).

From Table 5, respondents ranked "Contractors submit claims without adequate supporting documents" with a mean score of 4.00 which is greater than the Likert scale mean (3.00) as the first factor that causes delayed payments. This indicates that the high importance of Contractors' attention to submit adequate supporting documents for the progress of the projects. The time taken to exchange the documents between the Contractors and the Clients or Consultants to validate the documents took significant time. Moreover, the Contractors' incapability of submitting the correct document delays the progress payments so that shortage of cash for the Contractors will be encountered and cause many problems such as slow progress and work decline in productivity. Also the Contractors will not be able to purchase the needed material and equipment for work. In addition, the shortage of cash also expanded to Traders and Suppliers, which in turn leads to slow the work, this discussion coincides with Reeves (2013) about contractors' claim of payment without adequate supporting documents.

The second factor that causes delayed payments was Contractor's failure to agree to the valuation of work with a mean score of 3.5789which is greater than the Likert scale mean (3.00). This indicates that failure to agree with the valuation leads to argument between the Contractors and the Clients or Consultants who will take significant time to agree so that Contractors will not be able to purchase the needed material and equipment for work. In addition, the shortage of cash also expanded to Traders and Suppliers, which in turn leads to slow the work.

The third important factor ranked by Consultants was "Contractors' failure to understand the contract agreement" with a mean score of 3.2632which is greater than the Likert scale mean (3.00). This indicates failure to understand the contract agreement will lead to failure to understand duties and responsibilities of their companies and the clients as well. The miss interpretation of the contract document creates disagreement between the stakeholders and will be a significant factor for delaying to evaluate the requested payments. Delaying valuating payments means the contractor will be exposed to shortage of cash.

The respondents ranked "Requesting payment for defective works" in the fourthposition with mean score of 3.00which is equal to the Likert scale mean (3.00), which indicates the high importance of giving due attention not to request payment for defective works. Requesting payment for defective works will expose the stakeholders to argue and take much time to agree and effect the payments.

The fifth ranked factor was "Contractor suspension of work" with a mean value of 2.9474 which creates disputes between the parties of the project. The sequence of project activities will be affected, which lead to delay in payments. The sixth ranked factor was "Contractors delay in submitting claim" with mean value 2.7895which is less than the Likert scale mean (3.00) Delay in submitting claim means delaying the related payment requests from being evaluated and approved so as to affect the payment request timely. The last or the seventh ranked factor was "Insolvency or bankruptcy of the Contractor" with mean value 0f 2.6842 which is less than the Likert scale mean (3.00).

Table 6 below presents respondents' response to the causes of delayed payments by Contractor related factors. The factors are found from the Literature review as causes for delay in payments and are also practically seen as causes for same from the respondents in Ethiopian building and road construction industries.The respondents' responses are rated by using the Likert scale so as to identify the significant factors for the analysis of the regression model.

Table 6 - Responses to the causes of delay in payments in connection with Client related factors.

No	Hypothetical statement	Response	Frequency	%	Calculated Mean	t	df	P-value.
1	Clients poor financial management	Strongly agree	4	10.5				
		Neutral	8	21.1	3.90	19.87	37	0.000
		Agree	26	68.4				
		Total	38	100				
2	Clients failure to finance the project	Strongly disagree	4	10.5				
		Neutral	8	21.1	3.90	18.456	37	0.000
		Agree	26	68.4				
		Total	38	100				
3	Lack of commitment of Employees of the Employer	Disagree	22	57.9				
		Neutral	8	21.1				
		Agree	4	10.5	3.158	18.757	37	0.000
		Strongly agree	4	10.5				
		Total	38	100				
4	Clients delay in certification	Neutral	8	21.1				
		Agree	26	68.4				
		Strongly agree	4	10.5	3.90	18.873	37	0.000
		Total	38	100				
5	Problem with measurement and valuation process	Disagree	12	31.6				
		Neutral	12	31.6				
		Agree	14	36.8	3.05	18.737	37	0.000
		Total	38	100				

From the analyses made above in Table 6, Respondents gave different levels of scales. The calculated p-valuesfor all hypothetical statements were 0.000 which are less than the statistical significant value 0.05 ($P<0.05$).

From Table6, respondents ranked "Clients' poor financial management" with a mean score of 3.90which is greater than the Likert scale mean (3.00) as the first factor that causes delayed payments. This indicates that the high importance of contractors' financial management to manage the project as per the schedule and budget allocated for the project. Poor financial

management leads to abnormal effect on the cash flow of the project and hence, Contractors will be exposed to many problems such as slow progressand will not be able to purchase the needed material and equipment for work. This discussion is also supported by (Adalla and Hussien, 2002) that one of the significant cause for delayed payments is Clients' poor financial management.

The second factor that causes delayed payments was "Clients failure to finance the project" with a mean score of 3.90which is greater than the Likert scale mean (3.00). This indicates that failure to finance the project leads to slow or suspend the progress of the project. Contractors will not get payments for the executed works so that they cannot cover their material and equipment requirements and also cover their overhead or indirect costs. Dispute between the Clients andthe Contractors will emerge and the projects will be exposed to additional time extension and additional cost.

The third important factor ranked by Consultants was "Clients delay in certification with a mean value of 3.90which is greater than the Likert scale mean (3.00). Delay in certification of payments will delay the payment so that Contractors and Sub-Contractors will suffer with shortage of cash. The Contractor cannot deliver the necessary materials, equipment and labour so that the progress of the projects will be impeded.

The respondents ranked "Lack of commitment of Employees of the Employer" in the forth positionwith mean score of 3.15which is greater than the Likert scale mean (3.00), this indicates the high importance of giving due attention to control and follow up the Employees to expedite the certification process of payments. Otherwise, the payments will be delayed and Contractors will face cash flow problem.

The last and the fifth ranked factor was "Problem with measurement and valuation process" with amean value of 3.05which is greater than the Likert scale mean (3.00), this indicates the high importance of taking care when measurement and valuation process is made. The inaccurate measurement of the executed works will be rejected by the Clients and Consultant and hence, Contractors will be obliged to re-measure the executed works. Re- measuring will take time and create delayed payments.

Table 7 below presents respondents' response to the causes of delayed payments by contract related factors. These factors are found from the Literature review as causes for delay in payments and are also practically seen as causes for same from the respondents in Ethiopian building and road construction industries.The respondents' responses are rated by using the Likert scale so as to identify the significant factors for the analysis of the regression model.

Table7 - Responsesto the causes of delay in payments by contract related factors

Hypothetical statement	Response	F	%	Calculated Mean	t	df	P-value
Contracts used are too complicated to be understood by both parties	Disagree	22	57.90	2.6316	19.798	37	0.000
	Neutral	8	21.1				
	Agree	8	21.1				
	Total	38	100				
Contracts used are not comprehensive enough in terms of payment aspects	Strongly Disagree	4	21.1	3.1579	15.054	37	0.000
	Disagree	4	47.4				
	Neutral	12	21.1				
	Agree	18	47.4				
	Total	38	100				
The use of pay when paid clause	Disagree	8	21.1	2.8947	31.898	37	0.000
	Neutral	26	68.4				
	Agree	4	10.5				
	Total	38	100				

From the analyses made above in Table 7,Respondents rated different levels of scales. The calculated p-valuesfor all hypothetical statements were 0.000 which are less than the statistical significant value 0.05 ($P<0.05$).

From Table 7, respondents ranked "Contracts used are not comprehensive enough in terms of payment aspects" with a mean score of 3.1579which is greater than the Likert scale mean (3.00) as the first factor that causes delayed payments on contract related factors. This indicates that the standard condition of contract is not comprehensive, i.e., include clauses that can enforce all stakeholders equally. For example, the Contractor is enforced to submit performance bond when an agreement of construction work is made, however, the clients are not enforced to do the same. Hence, the contracts have to entertain all stakeholders equally. Lack of comprehensiveness of the contract heart particularly the Contractors.

The second factor that causes delayed payments was "The use of pay when paid clause" with a mean score of 2.8947which is less than the Likert scale mean (3.00). This factor is not practiced in Ethiopia. However, considering this factor in the standard conditions of contract and in the contract documents will alert the clients to pay the requested payments timely.This discussion is supported by Artidi and Chotibongs,2005) that Pay when paid known as "Back to Back" clauses never bring justice to the second parties, particularly for the sub Contractors.

The third factor ranked by consultants was "Contracts used are too complicated to be understood by both parties" with a mean value of 2.6316which is less than the Likert scale mean (3.00).This factor is not accepted by the majority of the respondents. Because, there are no contracts observed that are significantly complicated.

Table 8 below presents respondents' response to the causes of delayed payments by consultant related factors. These factors are found from the Literature review as causes for delay in payments and are also practically seen as causes for same from the respondents in Ethiopian building and road construction industries.The respondents' responses are rated by using the Likert scale so as to identify the significant factors for the analysis of the regression model.

Table 8 - Responses on causes of delay in payments byconsultant related factors.

Hypothetical statement	Response	F	%	The calculated Mean value	t	df	P-value
Delay in valuation and certification of interim payment	Strongly Disagree	8	21.1	3.000	16.237	37	0.000
	Neutral	14	36.8				
	Agree	16	42.1				
	Total	38	100				
Delay in valuation and approval of variation orders	Strongly disagree	4	10.5	2.900	16.237	37	0.000
	Disagree	8	21.1				
	Neutral	14	36.8				
	Agree	12	31.58				
	Total	38	100				
Heavy workloads of Consultant to carryout evaluation for works done	Strongly disagree	12	31.6	1.941	13.900	37	0.000
	Disagree	12	31.6				
	Neutral	10	26.3				
	Total	34	100				

From the analyses made above in Table 8, Respondents rated different levels of scales. The calculated p-valuesfor all hypothetical statements were 0.000 which are less than the statistical significant value 0.05 ($P<0.05$).

From Table 8, respondents ranked "Delay in valuation and certification of interim payment" with a mean score of 3.00which is equal to the Likert scale mean (3.00) as the first factor that causes delayed payments on consultant related factors. This indicates that consultants delay in certification obviously delay the payments. Hence, the problems encountered on the contractors and sub-contractors as discussed above will hinder the progress of the projects so that cost and time overruns will be created.

The second factor that causes delayed payments was "Delay in valuation and approval of variation orderswith a mean score of 2.90 which is less than the Likert scale mean (3.00). This factor is not practiced in Ethiopia. However, considering this factor in the standard conditions of contract and in the contract documents will alert the clients to pay the requested payments timely.

The third factor ranked by consultants was "Heavy workloads of Consultant to carryout evaluation for works"done with a mean value of 1.941which is less than the Likert scale mean (3.00). This factor can be importance because, as the consultant is busy by different projects, he will not see and certify the requested payments timely and as required.

4.5. RATE OF DELAY OF PAYMENT OBSERVED

The researcher tried to investigate the frequency and duration of delay payments from the targeted building and road projects for the study. Accordingly, from the respondents' response, most of the payments had not been effected on time. It was observed that payments delayed due to failure to effect the payment on time by the clients. 60.00% of respondents said that payments were delayed from one to two months, and about 30.00% of the respondents reported that payments delayed for more than four months in many occasions. The rest 10.00% of respondents observed that payments delayed from 15 days up to 40 days.

4.6. EFFECTS OF DELAYED PAYMENTS ON THE COST OVERRUN AND TIME OF COMPLETION

The researcher tried to investigate additional cost incurred and number of days elapsed above the time of completion stipulated in the Contract. However, it was difficult to identify the actual cost and time overrun encountered in connection with the delayed payments. From the questionnaire survey, respondents said that there is no exact data recorded regarding additional cost and time in connection with delayed payments. In addition to the delayed payments,there are also other significant factors affecting the project progress. In the Ethiopian construction industry, delayed payments are tolerated by domestic Contractors but not tolerated by foreign Contractors. In Ethiopia, foreign Contractors claim additional payment for delayed payments in terms of interest rate.

These are due to cultural differences between domestic Contractors and foreign Contractors; domestic Contractors which suffered from delayed payments, said that such tolerance is to avoid adversarial relationship with the stakeholders on that project and hence, to create conducive working environment. Actually, this is not the only reason for such tolerance; sometimes they tolerate such things to escape penalties due to their own mistakes, one of the commonest Contractors' problems is delay due to their own problems.

4.7. FACTORS OF DELAYED PAYMENTS IMPACTED ON COST AND TIME PERFORMANCE IN ROAD AND BUILDING CONSTRUCTION PROJECTS IN ETHIOPIA

In this study, 18 factors are taken as causes of delayed payments from the Contractor, Client, Contractual matters and Consultant related factors mentioned above that impacted in the cost and time performance of building and road construction projects. These factors are gathered from literature as shown in Tables 9and 12below and serve as the independent variables in the predictive model for the effects of delayed payments on cost and time overrun percentage of building and road construction projects.

4.7.1. FACTORS OF DELAYED PAYMENTS WITH ITS IMPORTANCE INDEX THAT IMPACTED ON COST PERFORMANCE

The factors of delayed payments below in Table 9 are Contractor, Client, Consultant and Contractual related factors. These delayed payment factors are significant among the different factors that impacted delay in payments on the cost performance of road and building projects.

Importance Index (II) = Occurrence frequency*Degree of severity

Table 9 - Factors that Impacted on Cost performancein road and building construction Projects.

Item	Factor identification	Frequency occurrence	Degree of severity	Important Index (II)	No. of respondents
1	Contractors delay in submitting claim	1	1	1	18
2	Requesting payment for defective works	1	1	1	16
3	Contractor submits claims without adequate supporting documents	4	3	12	29
4	Contractor's failure to agree to the valuation of work	3	3	9	28
5	Contractors' failure to understand the contract agreement	2	3	6	28
6	Contractor suspension of work	0	0	0	15
7	Insolvency/bankruptcy of the contractor	0	0	0	15
8	Clients poor financial management	4	4	16	30
9	Clients failure to finance the project	5	4	20	30
10	Lack of commitment of Employees of the Employer	2	1	2	19
11	Clients delay in certification	5	3	15	30
12	Problem with measurement and valuation process	2	2	4	20
13	Contracts used are too complicated to be understood by both parties	1	1	1	17
14	Contracts used are not comprehensive enough in terms of payment aspects	2	3	6	26
15	The use of pay when paid clause	0	3	0	12
16	Delay in valuation and certification of interim payment	2	3	6	20
17	Delay in valuation and approval of variation orders	1	2	2	19
18	Heavy workloads of Consultant to carryout evaluation for works done	1	1	1	18

From Table 9 above, Importance Index is calculated using degree of severity and frequency of occurrence. Important Index is used to calculate the Relative Importance Weight for ranking the significant factors of delayed payments that impacted on the cost overrun of road and building projects.

Accordingly, the significant delayed payment factors for cost overrun are arranged in descending order as presented on Table 10 below.

Table 10 - Factorsfor cost overrunarranged in descending order according to their corresponding RIW.

Relative Importance Weight (RIW) = Σ Π*corresponding no. of respondents

Total no. of respondents

Item	Factor identification	RIW	Rank
1	Clients failure to finance the project	80.53	1
2	Clients poor financial management	80.53	2
3	Clients delay in certification	80.53	3
4	Contractor submits claims without adequate supporting documents	77.84	4
5	Contractor's failure to agree to the valuation of work	75.16	5
6	Contractors' failure to understand the contract agreement	75.16	6
7	Contracts used are not comprehensive enough in terms of payment aspects	69.79	7
8	Delay in valuation and certification of interim payment	53.68	8
9	Problem with measurement and valuation process	53.68	9
10	Lack of commitment of Employees of the Employer	51.00	10
11	Delay in valuation and approval of variation orders	51.00	11
12	Contractors delay in submitting claim	48.32	12
13	Contracts used are too complicated to be understood by both parties	45.63	13
14	Heavy workloads of Consultant to carryout evaluation for works done	45.63	14
15	Requesting payment for defective works	42.95	15
16	Insolvency/bankruptcy of the contractor	40.26	16
17	Contractor suspension of work	40.26	17
18	The use of pay when paid clause	32.21	18

From Table 10 above, the significant delayed payment factors that impacted on the cost overrun of road and building projects are ranked based on their Relative Importance Index values. Ranking of the factors is used to identify the ten most significant factors that are used for the regression model analysis and further obtaining the predictive cost overrun percentage.

Accordingly, the ten most significant candidate independent variables are selected as shown on Table 11 below.

Table 11 - Candidate independent variablesfinal list for analysis of Cost performance

Item	Factor identification	RIW	Rank
1	Clients failure to finance the project	80.53	1
2	Clients poor financial management	80.53	2
3	Clients delay in certification	80.53	3
4	Contractors submit claims without adequate supporting documents	77.84	4
5	Contractors' failure to agree to the valuation of work	75.16	5
6	Contractors' failure to understand the contract agreement	75.16	6
7	Contracts used are not comprehensive enough in terms of payment aspects	69.79	7
8	Delay in valuation and certification of interim payment	53.68	8
9	Problem with measurement and valuation process	53.68	9
10	Lack of commitment of Employees of the Employer	51.00	10

The ten candidate independent variables shown on Table 11 above are the most significant factors chosen from the eighteen significant factors that impacted on the cost overrun of road and building construction projects.

These factors are used to analyze the regression model so as to obtain the predictive cost overrun percentage. The numbers of factors are limited to ten which are manageable to the regression model analysis.

4.7.2. FACTORS OF DELAYED PAYMENTS WITH ITS IMPORTANT INDEX THAT IMPACTED ON TIME PERFORMANCE

The factors of delayed payments below in Table 12below are Contractor, Client, Consultant and Contractual related factors. These delayed payment factors are significant among the different factors that impacted delay in payments on the time performance of building and road construction projects.

Importance Index (II) = Occurrence frequency*Degree of severity

Table 12 - Factors that Impacted on Time performance in road and building construction Projects

Item	Factor identification	Frequency occurrence	Degree of severity	Important Index (II)	No. of Respondents
1	Contractors delay in submitting claim	1	1	1	13
2	Requesting payment for defective works	1	1	1	13
3	Contractor submits claims without adequate supporting documents	4	3	12	29
4	Contractor's failure to agree to the valuation of work	3	3	9	28
5	Contractors' failure to understand the contract agreement	1	1	1	14
6	Contractor suspension of work	0	4	0	11
7	Insolvency/bankruptcy of the contractor	0	0	0	12
8	Clients poor financial management	4	4	16	30
9	Clients failure to finance the project	5	4	20	30
10	Lack of commitment of Employees of the Employer	3	1	3	18
11	Clients delay in certification	5	3	15	30
12	Problem with measurement and valuation process	3	1	3	16
13	Contracts used are too complicated to be understood by both parties	1	0	0	11
14	Contracts used are not comprehensive enough in terms of payment aspects	2	2	4	19
15	The use of pay when paid clause	0	3	0	10
16	Delay in valuation and certification of interim payment	5	3	15	20
17	Delay in valuation and approval of variation orders	1	4	4	17
18	Heavy workloads of Consultant to carryout evaluation for works done	1	3	3	15

From Table 12 above, Importance Index is calculated using degree of severity and frequency of occurrence. Important Index is used to calculate the Relative Importance Weight for ranking the significant factors of delayed payments that impacted time overrun on the road and building construction projects.

Accordingly, the significant delayed payment factors for Time overrun are arranged in descending order as presented on Table 13 below.

Table 13 - Factors for Time overrun arranged in descending order according to their corresponding RIW.

Relative Importance Weight (RIW) = $\frac{\Sigma \Pi * \text{corresponding no. of respondents}}{\text{Total no. of respondents}}$

Item	Factor identification	RIW	Rank
1	Clients failure to finance the project	84.47	1
2	Clients poor financial management	84.47	2
3	Clients delay in certification	84.47	3
4	Contractor submits claims without adequate supporting documents	81.66	4
5	Contractor's failure to agree to the valuation of work	78.84	5
6	Delay in valuation and certification of interim payment	56.32	6
7	Contracts used are not comprehensive enough in terms of payment aspects	53.50	7
8	Lack of commitment of Employees of the Employer	50.68	8
9	Delay in valuation and approval of variation orders	47.87	9
10	Problem with measurement and valuation process	45.05	10
11	Heavy workloads of Consultant to carryout evaluation for works done	42.24	11
12	Contractors' failure to understand the contract agreement	39.42	12
13	Contractors delay in submitting claim	36.61	13
14	Requesting payment for defective works	36.61	14
15	Insolvency/bankruptcy of the contractor	33.79	15
16	Contracts used are too complicated to be understood by both parties	30.97	16
17	Contractor suspension of work	30.97	17
18	The use of pay when paid clause	28.16	18

From Table 13 above, the significant delayed payment factors that impacted on the time overrun of road and building projects are ranked based on their Relative Importance Index values. Ranking of the factors is used to identify the ten most significant factors that are used for the regression model analysis and further obtaining the predictive time overrun percentage.

Accordingly, the ten most significant candidate independent variables are selected as shown on Table 14 below.

Table 14- Candidate independent variables final list for analysis of Time performance

Item	Factor identification	RIW	Rank
1	Clients failure to finance the project	84.47	1
2	Clients poor financial management	84.47	2
3	Clients delay in certification	84.47	3
4	Contractor submits claims without adequate supporting documents	81.66	4
5	Contractors' failure to agree to the valuation of work	78.84	5
6	Delay in valuation and certification of interim payment	56.32	6
7	Contracts used are not comprehensive enough in terms of payment aspects	53.50	7
8	Lack of commitment of Employees of the Employer	50.68	8
9	Delay in valuation and approval of variation orders	47.87	9
10	Problem with measurement and valuation process	45.05	10

The ten candidate independent variables shown on Table 14 above are the most significant factors chosen from the eighteen significant factors that impacted on the time overrun of road and building construction projects.

These factors are used to analyze the regression model so as to obtain the predictive time overrun percentage.

When the rankings of the top factors of cost performance of road and building construction projects are compared to the top factors of time performance of road and building construction projects, thereappears to be a great similarity. Top of the list on both Tables 10 and 13 are Clients failure to finance the project,Clients poor financialmanagement and Clientsdelay in certificationare undoubtedly considered as the most important factors thatdelay progress payments of the construction projects which leads to cost and time overruns. This is no surprise because Clients failure to finance the project will normally have a cost and time implication and

if the process is not well managed;it will undoubtedly affect the schedule negatively as well as the cost of the project.

The analyses of Tables 11 and 14 reveals that nine of the top ten factors ranked as cost and timeoverruns are the same. This shows that there seems to be an obvious similarity between the costperformance rankings and the timeperformance rankings.

4.8. ANALYSIS OF REGRESSION MODEL

Data for 38 construction projects was collected. These data include the occurrence and severity of factors presented in Tables9 and 12. An initial experimentation with a regression model that includes all 10 variables using SPSS 20 software was performed. Forward stepping method was used. Forward stepping begins with entering the most significant variable at the first step, and continues adding and deleting variables until none can significantly improve the fit. Forward stepping technique gave a model for predicting the percentage of cost and time overrun for construction projects depending on 10 variables (See Tables11&14) with a squared multiple R= 0.923 for cost overrun and 0.731 for time overrun. This indicates that the model is able to explain 92.30 % for cost overrun and 73.10% for time overrun which is a very good indicator of the model's expected performance.

Table 15 below presents the most significant factors of delayed payments with the corresponding Likert scale values for the regression analysis of to obtain predictive cost overrun percentage.

Table15 - The most significant factors of delayed paymentswith its Likert scale ratings for regression analysis of Cost overrun percentage

Item	Description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	Clients failure to finance the project	4	-	8	26	-
2	Clients poor financial management	-	-	7	26	5
3	Clients delay in certification	-	-	8	26	4
4	Contractor submits claims without adequate supporting documents	-	4	4	18	12
5	Contractors' failure to agree to the valuation of work	-	8	4	22	4
6	Contractors' failure to understand the contract agreement	-	14	4	16	4
7	Contracts used are not comprehensive enough in terms of payment aspects	4	4	12	18	-
8	Delay in valuation and certification of interim payments	8	-	14	16	-
9	Problem with measurement and valuation process	-	12	12	14	-
10	Lack of commitment of Employees of the Employers	-	22	8	4	4
	Mean	2	6	8	19	3

From Table 15 above, The Likert scale values and the mean values are the dependent values, whereas, the factors are the independent values used for the regression analysis. The analysis is conducted using SPSS version 20 software.

Table 16 below presents the most significant factors of delayed payments with its Likert scale ratings. The Likert scale ratings are used to obtain the predictive time overrun percentage.

Table16 - The most significant factors of delayed payments with its Likert scale ratings for regression analysis ofTime overrun percentage

Item	Description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	Clients failure to finance the project	4	-	8	26	-
2	Clients poor financial management	-	-	7	26	5
3	Clients delay in certification	-	-	8	26	4
4	Contractor submits claims without adequate supporting documents	-	4	4	18	12
5	Contractors' failure to agree to the valuation of work	-	8	4	22	4
6	Delay in valuation and certification of interim payment	8	-	14	16	-
7	Contracts used are not comprehensive enough in terms of payment aspects	4	4	12	18	-
8	Lack of commitment of Employees of the Employer	-	22	8	4	4
9	Delay in valuation and approval of variation orders	4	8	14	12	-
10	Problem with measurement and valuation process	-	12	12	14	-
	Mean	2	6	9	18	3

From Table 16 above, themean values are the dependent values, whereas, the factors with its Likert scale ratings are the independent values used for the regression analysis. The analysis is conducted using SPSS version 20 software.

Table 17 below presents the regression analysis out puts for each significant factor of delayed payments that impacted on Cost overrun of road and building construction projects.

Table 17- Regression analysis for Cost overrun

Model	R	R Square	Std. Error of the Estimate
1	0.961[a]	0.923	0.33457

Constant and variables		Equation	Coefficients
	Constant	k	-1.034
	Clients' failure to finance the project	A	0.141
	Clients' poor financial management	B	0.031
	Clients' delay in certification	C	-0.099
	Contractors submit claims without adequate supporting documents	D	0.105
	Contractors' failure to agree to the valuation of work	E	-0.051
	Contractors' failure to understand the contract agreement	F	0.770
	Contracts used are not comprehensive enough interims of payment aspects	G	0.094
	Delay in valuation in certification of interim payments	H	0.153
	Problem with measurement and valuation process	I	-0.092
	Lack of commitment of Employees of the Employers	J	-0.111

The inputs for the regression analysis were dependent and independent variables.

The dependent variables are the mean values shown on Tables 15 and 16 and the independent variables are the factors with their corresponding scale ratings and number of respondents. Accordingly, the following out puts are obtained: -

Percentage of Cost overrun:

= k+A+B+C+D+E+F+G+H+I+J

Each of the 10 variables have a 0 (un used or majority disagreement), or 1 (Used or majority agreement) value. Disagreement and agreement values are assigned based on the respondents' response to the most significant factors stipulated on Table 15. (International Journal of construction Engineering and Management, 2015; 4(4): 95-105)

Accordingly, Clients' failure to finance the project has value (1), Clients' poor financial management (1), Clients' delay in certification (1), Contractors submit claims without adequate supporting documents (1), Contractors' failure to agree to the valuation of works (1), Contractors' failure to understand the contract agreement (1), contracts used are not

comprehensive enough in terms of payment aspects(1), Delay in valuation and certification of interim payments (1), Problem with measurement and valuation process (1) and Lack of commitment of employees of Employers (0).Lack of commitment of Employees for Employers has a 0 value due to that 22 respondents disagreed with the factor.((International Journal of Construction Engineering and Management2015;4(4): 95-105)

Hence, the predicted cost overrun percentage obtained is as follows:

Cost overrun percentage = k (constant) + A (1) + B (1) – C (1) + D (1) – E (1) + F (1) + G (1) +H (1) – I (1) – J (0) = 0.018

This result means that the predicted cost overrun percentage is 1.80%.

This cost overrun percentage is obtained based on the most significant factors of delayed payments that impacted on the cost performance. These factors were ranked according to the 38 roads and building projects' respondents' response rate.

Table 18 below presents the regression analysis out puts for each significant factor of delayed payments that impacted on Time overrun of road and building construction projects.

Table 18 - Regressionanalysis for Time overruns

Model	R	R Square	Std. Error of the Estimate
1	0.855[a]	0.731	0.57765

Constant and variables		Equation	Coefficients
	Constant	k	0.312
	Clients failure to finance the project	A	-0.043
	Clients poor financial management	B	0.045
	Clients delay in certification	C	-0.043
	Contractors submit claims without adequate supporting documents	D	-0.088
	Contractors failure to agree to valuation of work	E	0.134
	Delay in valuation and certification of interim payment	F	0.202
	Contracts used are not comprehensive enough interims of payment aspects	G	0.060
	Lack of commitment of Employees of the Employer	H	-0.185
	Delay in valuation and approval of variation orders	I	-0.163
	Problem with measurement and valuation process	J	-0.083

Percentage of Time overruns:

=k+A+B+C+D+E+F+G+H+I+J

Each of the 10 variables have a 0 (un used or disagreement), or 1 (Used or agreement) value. Disagreement and agreement values are assigned based on the respondents' response to the most significant factors stipulated on Table 16.

Accordingly, Clients' failure to finance the project has value (1), Clients' poor financial management (1), Clients' delay in certification (1), Contractors submit claims without adequate supporting documents (1), Contractors' failure to agree to the valuation of works (1), Delay in valuation and certification of interim payment (1), contracts used are not comprehensive enough in terms of payment aspects(1), Lack of commitment of Employees of the Employer(0), Delay in valuation and approval of variation orders (1), and Problem with measurement and valuation

process (1).(International Journal of Construction Engineering and Management2015; 4(4): 95-105)

Hence, the predicted Cost overrun percentage obtained is as follows:

Time overrun percentage = k (constant) -A (1) +B (1) – C (1) - D (1) +E (1) + F (1) + G (1) -H (0) – I (1) – J (1) = 0.333

This result means that the predicted time overrun percentage is 33.30%.

4.9. MODEL VALIDATION FOR COST AND TIME OVERRUN PERCENTAGE

4.9.1. MODEL VALIDATION FOR COST OVERRUN

The researcher tried to get documented records that show additional costs incurred due to delayed payments.

However, except a few projects of Federal road projects that incurred interest rate for the delayed payments, none of buildings' and roads' projects (except few road projects) recorded any additional cost caused by delayed payments.

Of course, there are researches made on the cost and time overruns of road and building projects. But, the cost and time overruns were encountered due to different cases like, design change, variation orders, weather condition, etc…

However, there is no any research observed in Ethiopia, particularly, on the costandtime overruns caused by delayed payments.

The researcher however, tried to validate the cost overrun percentage by utilizing the cost incurred for five federal road projects constructed by foreign Contractors in terms of interest rate. The source of the records is Ethiopian Road Authority, Finance department.

Table 19 below presents list of Federal road projects that paid Interest for the delayed payments encountered.

Table 19 - Federal road projects that paid Interest rates for the delayed payments

Item	Project	Contractor	Contract amount (birr)	Interest paid (birr)
1	Gashena-Lalibela-Bilbala	China Rail way Eng.Group	1,141,499,642.56	6,127,781.91
2	Abiadi-Hawzen-Firewayni	China Rail way Eng.Group	874,321,916.68	6,516,338.04
3	Shire-Adigoshu	China Gezhouba Group	616,442,562.41	16,254,365.38
4	Access -Kesem sugar factory	CGC	341,798,502.02	1,205,825.32
5	Ethio infra	CGC	1,337,718,920.93	21,920,705.83

Source – Ethiopian Road Authority, Finance department

In Table 19 above, Five Federal road projects paid Interest rate for each delayed date from the time span for effecting progress payments which is stipulated on the contract clauses. Based on the Interest rates paid, cost overrun percentages are calculated and validated with the calculated predictive cost overrun percentage

Table20 below presents the Cost overrun percentage calculated based on the Interest rates shown on Table 19 above.

Table 20 - Cost overrun percentage obtained from the analysis

Item	Description	Cost overrun (%)
1	Gashena –Lalibela –Bilbila	0.54
2	Abiadi-Hawzen-Firewayni	0.75
3	Shire-Adigoshu	2.64
4	Access -Kesem sugar factory	0.36
5	Ethio infra	1.64

The Average Cost overrun for the five projects is (0.54+0.75+2.64+0.36+1.64)/5 = 1.19%

The predicted cost overrun percentage is 1.80%.

Hence, the average Cost overrun percentage is (1.19/1.80) *100 = 66.11% of the predicted cost overrun percentage. Therefore, in order to minimize the discrepancy between the cost overrun percentage obtained from the road projects used for validation and the predicted cost overrun

percentage, calibration for the parameters' coefficients is made as per shown here under on Table 21.

4.9.2. MODEL CALIBRATION FOR COST OVERRUN PERCENTAGE

Calibration is made for two significant factors of delayed payments that impacted on the cost overrun, i.e., for Clients delay in certification and Contractors failure to understand the contract agreement.In the SPSS soft ware regression model analysis, the output for"Clients delay in certification" was given less significant value with negative sign. However, considering the high rating given to the factor by the respondents during the questionnaire survey conducted, the negative sign is calibrated to positive sign and significant value.

Regarding "Contractors failure tounderstand the contract agreement", the factor had relatively less respondents' rating. Hence, the value ofthe coefficient of the SPSS soft ware output is calibrated.Table 21 below presents the calibrated coefficients for the factors of Cost overrun.

Table 21 – Calibrated coefficients for the Cost overrun percentage

Constant and variables		Equatio	Coefficients
	Constant	k	-1.034
	Clients' failure to finance the project	A	0.141
	Clients' poor financial management	B	0.031
	Clients' delay in certification	C	0.099
	Contractors submit claims without adequate supporting documents	D	0.105
	Contractors' failure to agree to the valuation of work	E	-0.051
	Contractors' failure to understand the contract agreement	F	0.565
	Contracts used are not comprehensive enough interims of payment aspects	G	0.094
	Delay in valuation in certification of interim payments	H	0.153
	Problem with measurement and valuation process	I	-0.092
	Lack of commitment of Employees of the Employers	J	-0.111

Percentage of calibrated Cost overruns:

=k+A+B+C+D+E+F+G+H+I+J

The predicted Time overrun percentage obtained is as follows:

Time overrun percentage = k (constant) -A (1) +B (1) + C (1) - D (1) - E (1) + F (1) + G (1) -H (0) – I (1) – J (1) = 0.011

Hence, the predicted cost overrun percentage after calibration is 1.10% which is 92.44% of the actual cost overrun percentage, i.e., 1.19% obtained from the five Federal road projects chosen for the validation purpose.

In light of the above, the calibrated coefficients of factors for the predicted cost overrun percentage can be used by Planners and cost estimators.

4.9.3. MODEL VALIDATION FOR TIME OVERRUN

As mentioned above for the cost overrun model validation, documented records that show additional time incurred and time extension allowed due to delayed payments.

The researcher tried to get documented records that show additional time incurred due to delayed payments.

However, except a few projects of Federal road projects that claimed interest rate for the delayed payment days, none of building and road projects (except few road projects) recorded any additional time or interest ratecaused by delayed payments.

Like researches for time overrun of construction projects, there are also researches made on the time overrun of road and building projects. But, the cost and time overruns were encountered due to different cases like, design change, variation orders, weather condition, Right of way,etc…

The researcher tried to validate the Time overrun percentage by utilizing data obtained from the above five federal road projects made by foreign Contractors. Hence, the time overrun for the five federal projects is shown below on Table 22. The source of the records is Ethiopian Road Authority, Finance department.

Table 22 below presents list of Federal road projects which have not been completed within the contract time and granted additional time extension following the delayed payments encountered.

Table 22 - Federal road projects that encountered Time overruns

Item	Project	Contractor	Contract time(days)	Completion time(days)	Time overrun (days)
1	Gashena-Lalibela-Bilbala	China Rail way Eng.Group	1474	1609	135
2	Abiadi-Hawzen-Firewayni	China Rail way Eng.Group	1135	1322	187
3	Shire-Adigoshu	China Gezhouba Group	1703	2363	660
4	Access -Kesem sugar factory	CGC	507	596	89
5	Ethio infra road project	CGC	1273	1683	410

Source – Ethiopian Roads Authority, Finance Department

In Table 22 above, the five Federal projects which have paid Interest rate for the delayed payments have also granted additional time for the time elapsed due to delayed progress payments. Accordingly, time overrun percentages are calculated for each project as shown on Table 23 below.

Table 23- Time overrun percentage obtained from the analysis

Item	Description	Time overrun (%)
1	Gashena –Lalibela –Bilbila	9.16
2	Abiadi-Hawzen-Firewayni	16.48
3	Shire-Adigoshu	38.76
4	Access -Kesem sugar factory	17.55
5	Ethio infra	32.21

The Average time overrun for the five projects is (9.16+16.48+38.76+17.55+32.21)/5 = 22.83%

The predicted time overrun percentage is 33.30%.

Hence, the average time overrun percentage is (22.83/33.30) *100 = 68.57% of the predicted time overrun percentage. Therefore, in order to minimize the discrepancy between the time overrun percentage obtained from the road projects used for validation and the predicted time

overrun percentage, calibration of coefficients for the parameters' coefficients is made as per shown here under on Table 24.

4.9.4. MODEL CALIBRATION FOR TIME OVERRUN PERCENTAGE

Calibration is made for the significant factors, i.e., for Clients failure to finance the project; Clients delay in certification and Contractors failure to agree to valuation of work. In the SPSS software regression model analysis, the output for"Clients failure to finance the project" and "Clients delay in certification" were give less significant value with negative sign. However, these two factors were given high rating by the respondents during the questionnaire survey conducted.

Hence, based on the respondents' rate given for the factors, the negative sign is calibrated to positive sign and considered as significant factors. With regard to the Contractors failure to agree to valuation of work, the respondents have relatively given fewer rates so that it is calibrated to negative sign and less significant.Table 24 below presents the calibrated coefficients for the factors of time overrun.

Table 24 – Calibrated coefficients for the Time overrun percentage

Constant and variables		Equation	Coefficients
	Constant	k	0.312
	Clients failure to finance the project	A	0.043
	Clients poor financial management	B	0.045
	Clients delay in certification	C	0.043
	Contractors submit claims without adequate supporting documents	D	-0.088
	Contractors failure to agree to valuation of work	E	-0.134
	Delay in valuation and certification of interim payment	F	0.202
	Contracts used are not comprehensive enough in terms of payment aspects	G	0.050
	Lack of commitment of Employees of the Employer	H	-0.185
	Delay in valuation and approval of variation orders	I	-0.163
	Problem with measurement and valuation process	J	-0.083

Percentage of calibrated Time overruns:

=k+A+B+C+D+E+F+G+H+I+J

The predicted Time overrun percentage obtained is as follows:

Time overrun percentage = k (constant) +A (1) +B (1) + C (1) - D (1) - E (1) + F (1) + G (1) -H (0) – I (1) – J (1) = 0.227

Hence, the predicted Time overrun percentage after calibration is 22.70% which is 99.43% of the existing cost overrun percentage obtained from the five completed Federal road projects which are chosen for the validation.

Therefore, the predicted Time overrun percentage after calibration shown above can be used for Planners and cost estimators.

CHAPTER FIVE

5.0. CONCLUSIONS AND RECOMMENDATIONS

5.1. CONCLUSIONS

- It was realized that Client-related factors were the highest-ranking group to most of the respondents in the study. Accordingly, the most frequent causes of delayed payment by Clients are: Clients failure to finance the project; Clients' poor financial management; and Clients delay in certification.

- On the other hand, next to the Clients, Contractors are also contributing for the delay of payments due to failure in submitting claims without adequate supporting documents, failure to agree to the valuation of work and failure to understand the contract agreement.

- It was also identified that contractual matters have also contribute to the frequent delay of payments, respondents stressed that contracts used are not comprehensive enough in terms of payment aspects and need to have clauses that can enforce and penalize the concerned parties who are the causes for the delayed payments.

- The survey result also indicated that Consultants' delay in valuation and certification ofinterim payment, delay in valuation and approval of variation orders is contributing for the frequent delay of payments. Delayed payment most likely will cause undue cash-flow problems for the contractors and this would have a devastating knock-on effect down the contractual payment chain. Failure to receive payment in a timely manner could expose contractors to a greater risk of failing to complete construction projects on time. The survey results indicate that the most serious effects of delayed payment are: delay in project's progress; cost overrun, creates cash flow problem and Low quality works due to contractors' uncertain financial condition, creates financial hardship for the company and Sub Contractors' refuse to continue works on the projects.

- Most of the respondents agreed that a mechanism for avoiding or reducing delayed payment needs to be taken in the form of contractual or statutory rights. According to the study results, the top five remedial actions of delayed payment chosen are: applying payment bond which insures contractors when payment is delayed by the Clients or

Owners; Creation of a right to a lien clause, follow up with clients using formal procedure, apply interest charge to the overdue payments and follow up with clients by direct communication. It was found that the method of applying overdue (interest) charges was very rare in the Ethiopian construction industry. Arbitration or litigation was also least likely to be chosen because it usually takes a long time to resolve disputes using these methods.

- A Multiple Regression model was developed to predict cost and time overrun percentages in road and building construction projects. The model was found accurate in predicting cost overrun percentage based on the most significant 10 causes (factors). These are: Clients failure to finance the project, Clients' poor financial management, Clients delay in certification, Contractors submit claims without adequate supporting documents, Contractors' failure to agree to the valuation of work, Contractors' failure to understand the contract agreement, Contracts used are not comprehensive enough in terms of payment aspects, Delay in valuation in certification of interim payments, Problem with measurement and valuation process andLack of commitment of employees of the employers. This research provides an approach for industry practitioners to predict cost and time overrun percentage for road and building construction projects in Ethiopia. On the other hand, it provides researchers with a methodology to build regression model for cost and time overrun percentage prediction. Computer implementation model is suggested for future research for easy implementation.

- The study concluded that professional bodies and government agencies should study and amend the existing standard forms of contract to provide protection and to promote well-balanced allocation of risk and a fair contract to all related parties. It should also be made mandatory for employers' financial capacity and credit rating to be made transparent to facilitate Contractors in selecting Employers who are credit-worthy and to improve the chances of the Contractor being paid. Perhaps, an increased sense of professionalism in the construction industry could overcome some of the problems related to delayed payment.

- The limitation of this study is that the respondents of the questionnaire are contractor biased. This happened due to that contractors are the main victims of delayed payments.

5.2. RECOMMENDATIONS

i. Government and public construction sectors should give due attention for the causes of delayed payments, record properly the cost incurred and time overrun encountered due to delayed payments.

ii. Computer implementation model should be formulated based on the recorded additional costs and additional time elapsed because of delayed payments for future research.

In addition, to improve the situation regarding delayed payments in the construction industry, the findings of this research must be addressed by a joint effort of all participants in the construction industry. This calls for:

iii. Enforcing clauses of delayed payment in contracts. Applying charges to overdue payments could be determined in the same way as late delivery charges have been applied.

iv. Applying payment bond which could provide a safety net to the Contractor in the event of delayed payment by the Clients or Owners.

v. Creation of a right to a lien clause which provides a right to take and hold or sell a property of a debtor as security for a debt until payment is made.

6. SUGGESTIONS FOR FURTHER STUDY

6.1. Impact of delay in payments on the quality of construction works.

6.2. The social and economic impact of delay in payments.

REFERENCES

Abdul-Rahman, H. and Berawi, M.A. (2002), Managing change in construction contracting, Contact Management, 42, 10-16 Ameer, A N.A.N. (2005a).Payment in the Construction Industry – Towards Zero-Default. QS National Convention 2005, 10 – 11 August 2005, Hilton, Kuala Lumpur, Malaysia, 119-127. Ameer, N.A.N. (2005b).

Abdul-Rahman, H. and Berawi, M.A. (2006). Delay mitigation in the Malaysian construction industry. Journal of Construction, Engineering and Management, ACSE, 132 (2): 125-133.

Abu Hammad, A. A., Ali, S. M. A., Sweis, G., J., and Basher, A."Prediction Model for Construction Cost and Duration in Jordan", Jordan J. of Civil Engineering, 2(3), 250-266, 2008.

Adballa, M.O. and Hussein, T.B. (2002). Causes of construction delay: Traditional contracts. International Journal of Project Management, 20: 67-73.

Alreck, P. L., and Settle, R. B. "The survey research handbook.'' Richard D. Irwin, Inc., Homewood, Ill, 1985.

Ameer Ali, N.A.N. (2005). Construction industry payment and adjudication act, reducing payment default and increasing dispute resolution efficiency. International Forum on Construction Industry Payment Act and Adjudication, 13 & 14 September 2005, Kuala Lumpur Convention Centre, Kuala Lumpur, Malaysia.

Articles of Agreement and Condition of Contract for Building Works (5th edn.)(1988). Accra, Ghana.

Artidi, D. and Chotibongs, R. (2005).Issues in subcontracting practice. Journal of Construction Engineering and Management ACSE, 8: 866-876. CIOB (Chartered Institute of Building) (2004). Construction Act consultation: Improving payment practices, 14th October, 2004 (Accessed August 8, 2005).

Attala, M., and Hegazy, T., "Predicting Cost Deviation in Reconstruction Projects: Artificial Neural Networks versus Regression" J. of Constr. Eng. and Manage, 129 (4), 405-411, 2003.

Banwell 1964; the placing and management of contracts for building and civil engineering work. Latham, M. (1994) Constructing the Team – The Final Report of the Government Industry Review of Procurement Arrangements in the UK Construction Industry.

Bob (2005 Bob, G. (2005): Construction industry payment and Adjudication act, Australian perspective, International forum on construction payment Act, Kuala Lumpur, Malaysia.

Chitrakar, P. (2004). Micro Hydropower Design Aids Manual. Kathmandu: Small Hydropower Promotion Project (SHPP/GTZ) and Mini Grid Support Program (MGSP/AEPC-ESAP), 2004.

Clifford J. Schexnayder and Richard E. Mayo 2004, Construction management fundamentals, 1st edition, McGraw-Hill Companies, Inc. New York.

Construction Industry Payment and Adjudication Act, Reducing Payment Default and Increasing Dispute Resolution Efficiency. International Forum on Construction Industry Payment Act and Adjudication, 13&14 September 2005, Kuala Lumpur Convention Centre, Kuala Lumpur, Malaysia. Artidi, D. and Chotibongs, R. (2005) Issues in Subcontracting Practice. Journal of Construction Engineering and Management ACSE. Volume 8: 866-876.

Davis Langdon &Seah Consultancy (2003). Construction payment blues –Why that domino effect? Executive Summaries for the Practitioner, 3 (3): September 2003. Johnston, S. (1999). Debts and interest in the construction industry, a guide to the Late Payment of Commercial Debts (Interest) Act 1998. Thomas Telford Limited: London.

Dogan, S.Z, Arditi, D., and Gunaydin, H.M. "Determining Attribute Weights in A CBR Model for Early Cost Prediction of Structural System" J. of Constr. Eng. and Manage, 132(10), 1092-1098, 2006.

FIDIC (1999) General Conditions of Contract for Construction

Gow, P. (2006). Security of Payment and the Western Australian Construction Contract Act. Adjudication Seminar: An End to Cash Flow Problems in the Construction Industry. Kuala Lumpur: Construction Industry Development Board (CIDB) Malaysia.

Ibbs, W.C., and Ashley, D.B., "Impact of Various Construction Contract Clauses." J. of Constr. Eng. and Manage, 113(3), 501-521, 1987

Ir. Harbans Singh K.S. (2003).Engineering and construction contracts management –Post commencement practice. Lexis Nexis Business Solutions: Singapore.

Ji, S.H., Park, M., and Lee, H.S." Cost Estimation Model for Building Projects Using Case-Based Reasoning" Can. J. Civ. Eng., 38, 570-581, 2011.

John Murdoch and Will Hughes 2000, Construction contracts law and management, 3rd edition, Spon press. Pp.17, 234-244

Johnston, S. (1999). Debts and Interest in the Construction Industry: A guide to The Late Payment of Commercial Debts (interest) Act 1998. Thomas Telford Limited, London30 June 2005. http://www.vnunet.com/articles/print/2139274 (Accessed February 13, 2006).

Kangari, R. "Risk Management Perceptions and Trends of U.S. Construction." J. of constr. Eng. and Manage, 121(4), 422-429, 1995.

Kennedy, P. (2005): Statistics and trends in statutory adjudication in the U.K since 1998.

Kholif, W., Hosny, H., and Sanad, A. "Analysis of Time and Cost Overruns in Educational Building Projects in Egypt" Int. J. of Eng. and Technical Research (IJETR), ISSN: 2321-0869, 10(1), 2013.

Kim, K. J., and Kim, K."Preliminary Cost Estimation Model Using Case-Based Reasoning and Genetic Algorithms" J. Comput. Civ. Eng., 24 (6), 499-505, 2010.

Koo, C.W., Hong, T., Hyun, C., and Koo, K. "A CBR-Based Hybrid Model for Predicting a Construction Duration and Cost Based on Project Characteristics in Multi-Family Housing Projects" Can. J. Civ. Eng., 37, 739-752, 2010

Latham, M. (1994).Constructing the team. HMSO: London

Liebing.R.W. (2001) the Construction Industry: Processes, Players and Practices:Prentice Hall.

Lim, C.F. (2005). Malaysian construction industry -The present dilemmas of the unpaid Contractors.International forum on Payment Act and Adjudication. Kuala Lumpur: CIDB and ISM.

Lip, Euginie (2003). Construction payment blues –Why that domino effect? Davis Langdon and Seah Consultancy: Executive Summaries for the Practitioner, 3: 1-4.

Lip, Euginie (2006).Curing the Ills of Non-Payment in the Construction Industry – the Singapore Experience.8th Surveyors' Congress. Kuala Lumpur: ISM

Meng, X (2005).Guarantees for Contractor's Performance and Owner's Payment inChina.Journal of Construction Engineering and Management ACSE. Vol. 3: 232-237.

Murdoch and Hughes (1996), Murduch J. and Hughes, W. (1996): Construction contract – law and management 3rd Edition London. Spon press.

Naseem, N.A. (2005) Construction Industry Payment and Adjudication Act: International Forum on Construction Industry Payment Acts and Adjudication. Kuala Lumpur: CIDB and ISM.

Nassar, K.M., Gunnarsson, H.G., and Hegab, M.Y. "Using Weibull Analysis for Evaluation of Cost and Schedule Performance" J. of Constr. Eng. and Manage, 131 (12), 1257-1262, 2005.

Nazir, N.Z. (2006). Late payment problems among contractors in Malaysia.

Ngala J.N., Adegoke I.O, Otiena F. O. (2005). Evaluating Project Management Techniques in Small, Medium enterprises. Johannesburg.

Nicholas, N. (2005). Late payment culture creates domino effect. Accountancy Age

Oberlender, G.D., and Trost, S.M. "Predicting Accuracy of Early Cost Estimates Based on Estimate Quality." J. of Constr. Eng. and Manage, 127, 173-182, 2001.

Oon, C. K., Ir. (2002). Standard Construction Contracts in Malaysia.Seminar on Construction Contracts and Arbitration. 18 October 2003, IEM, Perak Branch, 1 – 16.

Pettigrew, R. (2005). Payment under Construction Contract Legislation. London: Thomas Telford.

Rae, W. S. (2002). Is The Law Losing Interest In Construction? James R Knowles (Singapore) Pte Ltd. Unpublished.

Rajoo, S. (2003). Why Arbitration is Popular in Malaysia? Malaysia: Seminar Issues in Construction Contract. Kuala Lumpur: KLRCA.

Reeves, K. (2003). Pay up. JUBM Construction News and Views, 1/2003: 4-6.

Sonmez, R., Ergin, A., and Birgonul. T. "Quantitative Methodology for Determination of Cost Contingency in International Projects", J. of Manage. in Eng., 23,(1), 35-39, 2007.

Sulhaini A. (2005): No joy for small builders. The star online, 8 May 2005, (Retrieved June 2010). Http://the star.com.my/news.asp,File 2010.

Trost, S., M., and Oberlender, G., D. "Predicting Accuracy of Early Cost Estimates Using Factor Analysis and multivariate Regression", J. of constr. Eng. and Manage, 129 (2), 198-204, 2003.

Ward P.A (1979): Organization and procedures in the construction industry, England, Macdonald &Econs.

APPENDICES

APPENDIX (A)

DATA COLLECTION QUESTIONNAIRE

A Survey to establish a "Tool for predicting the effects of delay in payment on the performance of Building and Road construction Projects in Ethiopia".

Dear Sirs,

The purpose of this survey is to obtain data for the specified research being conducted as a partial fulfillment of M.Sc. Degree in Construction Technology and Management in Addis Ababa Science and Technology University.

The aim of this questionnaire is to obtain professional opinion on issues of delayed payments and establishing a "Tool for predicting the effects of delayed payments on the performance of Road and Building Projects in Ethiopian Construction Industry".

The study is presumed to identify the possible root causes and impacts of delayed payments and establish a "Tool for predicting the effects of delayed payments on the performance, i.e., on the time of completion and cost overrun of Road and Building projects in Ethiopian construction Industry". The "Tool" will help to all stakeholders of the construction Industry to predict the outcomes of delayed payments.

The information supplied in this completed questionnaire will be used solely for broad research purposes (for academic purpose). All specific company and questionnaire information will be kept confidential at all times.

Only generalized analysis of the information contained within this completed questionnaire will be utilized in the research process.

Your response in this regard therefore, is highly valuable and contributory to the outcome of the research.

Thank you for your invaluable time and cooperation in advance.

Regards,

MulugetaYigzaw

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Addis Ababa Science and Technology University.

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PART ONE – STRUCTURED QUESTIONS

SECTION I

GENERAL INFORMATION.

The following questions are designed to get general information about the Company and respondents of the questionnaire. So please, give appropriate response for each question.

Please, tick in the box provided and fill in the blanks.

1. Name of the firm or organization: ……..

   Address: ……

2. The classification category of the respondent Consultant Company.

○ Category one

3. The classification category of the respondent construction company.

   ○Grade one GC/BC/RC

4. The position of the respondent in the company.

○ Managing Director ○ Project Manager ○ Engineer ○ Site Manager o Foreman

5. How long the respondent has construction work experience.

5.1. ----------years in the company he is now engaged.

5.2. ----------years in other construction companies.

6. State the number of year the organization / company has experience in construction.

○ Less than 5 years ○ 6 – 10 years ○ More than 10 years.

SECTION II.

The following questions are designed to answer the root causes of delayed in payment in the Road and Building construction projects in Ethiopia. So please, give appropriate response for each question.

Please, tick in the box.

Each scale represents the following rating: (5) = strongly Agree, (4) = Agree, (3) = Neutral, (2) = Disagree, (1) = strongly Disagree.

Question 2.1: What are the causes of delayed payments in connection with Contractor related factors? Please, tick one box.

Item	Contractor-related factors	1	2	3	4	5
1	Contractor's delay in submitting claims.					
2	Requesting payment for defective works.					
3	Contractor submits claims without adequate supporting documents.					
4	Contractor's failure to agree to the valuation of work.					
5	Contractor's failure to understand the contract agreement.					
6	Contractor's Suspension of work.					
7	Insolvency/bankruptcy of the Contractor.					

Question 2.2: What are the causes of delay in payments in connection with Client related factors? Please, tick one box.

Item	Client-related factors	1	2	3	4	5
1	Client's poor financial management.					
2	The Client's failure to finance the project.					
3	Lack of commitment of Employees of the Employer.					
4	Clients' delay in certification.					
5	Problem with the measurement and valuation process.					

Question 2.3: What are the causes of delay in payments in connection with Contractual related factors?, Please, tick one box

Item	Contract-related factors	1	2	3	4	5
1	Contracts used are too complicated to be understood by both parties.					
2	Contracts used are not comprehensive enough in terms of payment aspects.					
3	The use of 'pay-when-paid' clauses.					

Question 2.4: What are the causes of delay in payments in connection with Consultant related factors?, Please, tick one box

Item	Consultant-related factors	1	2	3	4	5
1	Delay in valuation and certification of interim payment.					
2	Delay in valuation and approval of variation orders.					
3	Heavy workloads of Consultant to carryout evaluation for works done.					

SECTION III.

The following questions are designed to answer Impacts of delay in payments in the Road and Building construction projects in Ethiopia. So please, give appropriate response for each question.

Please, tick in the box.

Each scale represents the following rating: (5) = strongly Agree, (4) = Agree, (3) = Neutral, (2) = Disagree, (1) = strongly Disagree.

Question 3.1: What are the Impacts of delay in payments?, Please, tick one box.

Item	Impacts of delay in payments	1	2	3	4	5
1	Delay in Project's progress.					
2	Cost overrun.					
3	Low quality works due to Contractor's uncertain financial condition.					
4	Abandonment of the project.					
5	Creates negative relationship among parties.					
6	Creates financial hardship for the company.					
7	Subcontractors' refuse to continue works on the project.					
8	Creates cash flow problem.					
9	Leads to bankruptcy or liquidation.					
10	Results in formal dispute resolution, e.g. litigation/arbitration.					

SECTION IV.

The following questions are designed to answer the remedies for delayed payment in the Road and Building construction projects in Ethiopia. So please, give appropriate response for each question.

Please, tick in the box.

Each scale represents the following rating: (5) = strongly Agree, (4) = Agree, (3) = Neutral, (2) = Disagree, (1) = strongly Disagree.

Question 4.1: What are the Remedies taken for delayed payments?, Please, tick one box.

Item	Remedies to be taken	1	2	3	4	5
1	Follow-up with Clients using formal procedure.					
2	Follow-up with Clients by direct communication only.					
3	Slow down the construction work at site until payment is received.					
4	Suspend the construction process until payment is received.					
5	Apply interest charge to the overdue payments.					
6	Applying loan to utilize project.					
7	Initiate arbitration or litigation.					

PART TWO - OPEN ENDED QUESTIONS

1. If you have observed delayed payments in your Company, what were the causes for the delayed payment problem that you were confronted with?

_____

_____

_____

2. What were the consequences of the delayed payment problem on the project and in your work?

_____

_____

_____

3. How many times have you observed delay of payments, and for how long the payments delayed?. Please reply also the causes along with the frequency of the delayed payments.

_____

_____

_____

4. How many days are totally delayed to effect the payments to the Contractor and following the delayed payments, how many days are elapsed above the time of completion?

_____

_____

_____

5. How much additional cost is incurred to the projects or cost overrun for the total days of delayed payments encountered during the contract time of the project?._____

_____

_____

6. What do you recommend to alleviate delay in payment problems?

_____

_____

_____

7. What remedies have you observed for the delayed payment encountered?_____

_____

_____

8. If you haven't ever encountered construction payment related problems in construction projects how did you avoid them?

_____

_____

_____

APPENDIX (B)

LIST OF ROAD AND BUILDING PROJECTS FOR THE STUDY

LIST OF FEDERAL ROAD PROJECTS

Item	Project	Contract amount (Birr)	Contract time (days)	Executed amount (Birr)	Actual completed time (days)
1	A.A - Jimma	405,900,000.00	1080.00	650,100,000.00	2190.00
2	Addis - Modjo – Awassa	310,100,000.00	2,130.00	397,388,778.94	2,250.00
3	Modjo - Awash Arba	227,400,000.00	1098.00	375,400,000.00	2040.00
4	Gewane - Mille	249,000,00.00	1200.00	357,600,000.00	1530.00
5	Logia - Semera	154,271,535.40	1,092.00	176,109,267.89	2,126.00
6	TarmaBer -Kombolcha	289,800,000.00	1080.00	383,200,000.00	1100.00
7	Woldiya - Alemata	150,300,000.00	1080.00	230,900.000.00	1860.00
8	B/Mariam - Wukero	203.400,000.00	1080.00	240.500,000.00	2010.00
9	DebreMarkos - Merawi	327,000,000.00	1080.00	575,800,000.00	1170.00
10	Awash - Hirna	256,500,000.00	1080.00	297,400,000.00	1860.00

Source: Ethiopian Roads Authority (Projects' completion report)

LIST OF ADDIS ABABA CITY ROAD PROJECTS

Item	Project	Contract amount (Birr)	Contract time (days)	Executed amount (Birr)	Actual completed time (days)
1	Yekatit 12 square – Afenchober – Semen hotel urban street	36,213,579.00	365.00	54,334,900.00	1330.00
2	Megenagna – Meskel Square – Torhiloch (Lot1 & Lot 2) Contract 1	1,162,448,900.69	550.00	1,214,586,635.23	726.00
3	Meskel flower – Bole - Ruwanda	49,587,265.63	575.00	78,558,144.39	2370.00
4	Mekanisa roundabout – Addis sefer	36,554,500.46	90.00	41,654,715.37	270.00
5	Megenagna – Ayat	224,055,813.14	420.00	265,104,212.54	709.00
6	Gotera – Wellosefer	30,000,000.00	180.00	32,450,000.00	225.00
7	WingetAsco Bridge	154,485,787.41	330.00	181,139,826.67	1048.00
8	Dama Hotel – Hanamariam	54,214,003.00	365.00	68,563,420.00	1155.00
9	Shola Gebeya – Lemhotel – Anbessa Garage	109,512,767.87	575.00	145,311,625.22	1232.00
10	AbunePetros square - Pastuer	144,440,764.43	224.00	150,374,645.56	763.00

Source: Addis Ababa City Road Authority (Projects' Progress and completion report)

LIST OF BUILDING PROJECTS

Item	Project	Contract amount (Birr)	Contract time (days)	Executed amount (Birr)	Actual completed time (days)
1	AIC mixed use building-Addis Ababa	40,000,000.00	240	45,550,673.00	360
2	Piassa mixed use building-Addis Ababa	24,600,000.00	720	32,724,422.00	1800
3	Nile petroleum office building-Addis	27,700,000.00	600	28,050,459.00	720
4	K & T Office Building-Addis Ababa	15,456,000.00	1080	17,123,986.00	1440
5	ICS Facility building	3,429,300.00	720	5,900,968.00	905
6	Addis Ababa Education Bureau	60,343,438.45	720	64,435,137.51	1020
7	Police Commission head office	99,444,398.79	800	107,596,654.50	1085
8	Credit & Savings Institution-Addis Ababa HQ	36,914,578.87	600	44,148,947.17	845
9	Arada Sub-city Fire and Emergency service	58,076,253.18	540	63,226,863.98	825
10	Sport commission	51,931,227.89	540	60,215,712.98	795
11	Environmental Conservation Authority bureau	42,763,245.00	480	47,445,126.63	560
12	Menelik Hospital additional building	47,346,957.00	510	56,367,742.22	740
13	RasDesta hospital Maternity block	32,450,000.00	360	41,125,145.35	475
14	Tegbareid TVET College building	54,306,678.00	540	60,105,104.60	705
15	Youths and children theatre	59,645,768.00	600	64,447,176.98	675
16	Kotebe teachers college additional blocks	35,453,268.00	360	38,247,398.00	420
17	Akaki-Kaliti TVET additional Blocks	45,824,780.00	360	47,644,577.32	480
18	Zewditu Memorial hospital additional building	65,124,908.00	720	75,557,789.93	920

Source: S7 Architects and Consultants and Addis Ababa Housing Development and Construction Bureau.